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AN INQUIRY INTO THE EFFECTS OF OCCUPATION ON THE PULMONARY CONDITION OF STONE-MASONS.

By KEITH R. MOORE, M.B., B.S., D.P.H.,
Medical Officer in Charge, Commonwealth Health
Laboratory, Kalgoorlie, Western Australia,

AND

C. A. KUHLMANN, M.B., B.S.,
Medical Officer in Charge, Mobile X Ray Unit,
Commonwealth Department of Health,
Western Australia.

At the request of the Commonwealth Court of Conciliation and Arbitration, the Commonwealth Department of Health undertook during 1938 an investigation to determine the incidence of silicosis and similar diseases amongst stone-masons in New South Wales, Victoria and South Australia, and to

advise on the possibilities of prevention of such industrial disease.

A total of 355 employees in this industry was examined by clinical and radiographic methods, and an inspection of working conditions in certain stone-masons' yards was made. A series of dust counts (the Owens dust counter being used) was also made to cover the various industrial processes.

Previous Investigations.

In 1924, out of a series of 716 men working with sandstone, granite, trachyte and marble, and examined under the auspices of the New South Wales Board of Trade, 286 were stone-masons. Of 271 masons who had worked for more than two years in the industry, 63, or 23.3%, were diagnosed as suffering from silicosis, and 6 others, or 2.2%, had tuberculosis. Of those who had worked over forty years in the industry, 48% had silicosis.⁽¹⁾

TABLE I.
Results of Inquiries into the Pulmonary Condition of Workers Exposed to Sandstone and Granite Dust.

Type of Stone.	Country.	Date of Inquiry.	Number Examined.	Number Affected (Silicosis).	Percentage Affected.	Number Found to be Tuberculous.	Percentage.	Remarks.
Sandstone.	Australia (Sydney).	1924	716	123	17.2	16	2.2	Rockhoppers, stone-masons and others radiologically examined.
	Germany.	1927	112	78	69.2	—	—	Up to 50 years' exposure.
		1928	40	25	62.5	—	—	Shorter exposure.
		1928	133	38	28.5	—	—	Shorter exposure.
		1928	39	8	31.0	—	—	
	Great Britain.	1930	171	57	33.3	—	—	Stone-masons; service not known.
	Holland.	1899	2,012	—	—	169	8.3	Clinical examination only.
		1900	177	—	—	22	12.4	Stone-masons; clinical examination only.
		1906	356	—	—	52	14.6	
		1923	963	232	24.1	—	—	
Granite.	Canada.	1924 1928-9	110 133	8 34	7.3 30.1	—	—	Averaging 31 years' exposure.
	Germany.	1928	93	7	7.6	—	—	Not radiologically examined.
	Great Britain.	1930	139	25	18.0	—	—	Stone-masons.

In several other countries investigations into the pulmonary condition of workers with sandstone and granite have been made, and reference to the reports on these investigations may be observed in the Report of the International Conference on Silicosis (Johannesburg, 1930).⁽²⁾

Table I gives a summary of the results of these examinations.

An extensive survey of the health of granite workers was carried out in the United States of America by the Public Health Service, and a report was published in 1930.⁽³⁾ In this investigation the incidence of pulmonary disease was correlated with the intensity of exposure to dust. Silicosis and tuberculosis were found to vary directly with length of exposure and the rate of development of silicosis to vary directly with intensity of exposure to dust. The incidence of tuberculosis was found to have increased with the introduction of pneumatic tools.

Present Investigation.

Table II gives the numbers of men examined in each of the three States visited, classified according to occupations.

Working Conditions.

Inspections of working conditions were made in 12 stone-masons' yards in Melbourne and Adelaide, and a series of 63 dust counts was taken.

In general, employees in this industry work in sheds situated in open yards. These sheds are high and roofed over, and are generally open on one or three sides to the weather. The masons are usually segregated from other workers by a space of several yards, and in some places work in

separate sheds. No attempts at artificial ventilation are used. Water is used to suppress the liberation of fine dust in certain processes. A considerable amount of stone dust, which accumulates on the floor, is stirred up by traffic and windy weather. Stone-masons work with both pneumatic and hand-tools for the purpose of surfacing, chiselling and drilling. These processes are dry and a brush is used to clean the surface of the stone.

Polishing is done by machines and is usually accompanied by the use of water. In some instances a fine jet of sand is impinged on the surface

TABLE II.

Occupation.	New South Wales.	Victoria.	South Australia.	Total.
Masons, including letter-cutters, fitters and setters	50	141	77	268
Polishers	1	28	9	38
Sand-blasters	—	2	—	2
Sawyers:				
Frame sawyers	—	7	7	14
Carborundum sawyers	2	13	8	23
Others:				
Foreman	—	—	1	1
Crane-driver	—	1	—	1
Labourers	—	4	4	8
	53	196	108	355

of the stone by an air blast. Sawing of stone is usually accomplished by means of the frame-saw or by a carborundum wheel. Both these processes are accompanied by the use of water.

Three main types of stone are used in this industry, namely, hardstone or granite, freestone or sandstone, and marble or limestone. Granite contains about 70% of silica, of which from 25% to 35% is believed to be free silica. Sandstone contains free silica to the extent of 86% to 95%, while marble and limestone have practically none, consisting principally of calcium carbonate.

Of 268 stone-masons examined, 152 had worked practically entirely on granite, 17 on sandstone and 11 on marble, the remainder having worked on more than one variety of stone.

Dust Counts.

The series of dust counts taken within three to five feet from the work revealed, with two or three exceptions, very small numbers of injurious dust particles. The exceptions comprised work with turning and surfacing machines and a brush-hammer, as well as a carborundum machine and hand chiselling. Higher results would probably be obtained if counts were made of material taken nearer to the source of the dust.

Results of Medical Examinations.

Each man examined, after particulars regarding class of occupation and industrial history had been noted, was questioned as to his past medical history and the presence or otherwise of symptoms. Following this a clinical examination was made and a radiograph of the chest was taken. In the consideration and tabulation of the results obtained three factors have been held to be of prime aetiological importance, namely: (i) class of occupation, (ii) length of employment, (iii) nature of the stone principally used.

Symptoms.

Cough, with or without sputum, was complained of by 26.5% of those examined. It is probable that in a fair proportion of this number the cough is not due to occupation, and that in another proportion the cough is pharyngeal or laryngeal in origin from the irritation of larger dust particles, and not due to pulmonary fibrosis. The percentage of polishers and sawyers complaining of this symptom was higher than that of masons, and employees working with sandstone were considerably more affected than those working only with granite.

Dyspnoea was complained of by 5.6% of the total examined. Of those working with sandstone, 23.5% were affected, while only 2.6% of those working with granite complained of dyspnoea.

Pain in the chest was complained of by only 2.9% of the men examined. The presence of blood in the sputum, or more severe hæmoptysis, was acknowledged by 2.9% also. In a third of these cases the origin of the lesion was doubtful. Loss

of weight was mentioned in only three cases, or less than 1%. In two of these the subjects were found to be tuberculous.

Previous History of Respiratory Disease.

Previous attacks, during industrial life, of pneumonia, pleurisy or bronchitis were admitted by 17.1% of the men examined. Of these, 11.5% had had pneumonia or pleurisy, and the remainder recurrent bronchitis. Here again the incidence among workers in sandstone is very much higher than among those working in granite.

Detection of Physical Signs of Pulmonary Disease.

Physical signs in the lungs were observed in 17 individuals, or 4.8% of those examined. In seven of these cases the signs were those of bronchitis; in six pulmonary tuberculosis, either active or latent, was noted; in two cases evidence of advanced generalized pulmonary fibrosis was obtained by the stethoscope; and in the remaining two cases the signs were those of recent pleurisy.

Results of Radiographic Examination.

Chest radiographs of all examinees were examined for the presence of generalized pulmonary fibrosis of the pneumonokoniotic or silicotic type, for pulmonary tuberculosis in the healed, latent or active stage, for recent or old pleurisy, for emphysema and for any other abnormal condition.

Advanced age *per se* causes the appearance of a certain amount of fibrosis in chest radiographs, and due allowance was made for this factor in the evaluation of results obtained, particularly with regard to industrial disease.

The criterion for the diagnosis of true silicosis from radiographs is the presence of definite and uniform mottling through both lung fields, which is evidence of the formation of fibrotic nodules in the lungs; no case has been called silicotic in the absence of that feature. Two distinct types of fibrosis of moderate or advanced degree were observed among those examined. One is a true silicosis; the other type is evidenced in skiagrams as a uniform increase in the peribronchial shadows, giving a felted appearance to the lung fields and not showing nodulation. This condition has been designated in the present report under the generic term of "pneumonokoniosis", and further reference to the two conditions will be made later. It is not considered possible to differentiate the two conditions in their early stages, in which the radiographs reveal merely a greater or less degree of accentuation of the peribronchial markings. In the estimation of the degree of fibrosis an arbitrary division into grades representing the normal chest and slight, moderate and advanced fibrosis was adopted, while true silicotics were enumerated in a separate column.

Tuberculous lesions, either complicating a fibrotic process or alone, were shown separately.

The radiographic diagnoses of the 355 employees examined are shown in Table III according to length of service.

TABLE III.
Incidence of Industrial Pulmonary Disease and Tuberculosis According to Occupation and Length of Service.

Years Worked.	Condition.									Totals.
	Normal.	Slight Fibrosis.	Moderate Fibrosis.	Advanced Fibrosis.	Silicosis.	Fibrosis or Silicosis with Tuberculosis.	Fibrosis with Doubtful Tuberculosis.	Active Tuberculosis.	Healed or Latent Tuberculosis.	
A. Masons, letterers, axers, etc.—										
10 and under	40	7 ^a	2	—	—	—	—	—	—	49
11 to 20	33	36	8	1	—	—	—	1	1	80
21 to 30	8	18	22	2	—	—	1	—	4	55
31 to 40	4	7	30	5	6	1 ^a	2	—	—	55
41 and over	1	3	17	5	2	1	—	—	—	29
Totals	86	71	79	13	8	2	3	1	5	268
B. Polishers—										
10 and under	8	—	—	—	—	—	—	—	—	8
11 to 20	11	6	2 ^a	—	—	—	—	—	—	19
21 to 30	1	2	7	—	—	—	—	—	—	10
31 to 40	—	—	1	—	—	—	—	—	—	1
41 and over	—	—	—	—	—	—	—	—	—	—
Totals	20	8	10	—	—	—	—	—	—	38
C. Sand-blasters—										
10 and under	—	—	—	—	—	—	—	—	—	—
11 to 20	1	—	—	—	—	—	—	—	—	1
21 to 30	—	—	1	—	—	—	—	—	—	1
31 to 40	—	—	—	—	—	—	—	—	—	—
Totals	1	—	1	—	—	—	—	—	—	2
D. Frame sawyers—										
10 years and under	6	1	—	—	—	—	—	—	—	7
11 to 20	1	2	1	—	—	—	—	—	1	5
21 to 30	1	—	—	—	—	—	—	—	—	1
31 to 40	—	1	—	—	—	—	—	—	—	1
Totals	8	4	1	—	—	—	—	—	1	14
E. Carborundum machinists—										
10 and under	8	6	1	—	—	—	—	—	—	15
11 to 20	5	2	—	—	—	—	—	—	—	7
21 to 30	1	—	—	—	—	—	—	—	—	1
31 to 40	—	—	—	—	—	—	—	—	—	—
Totals	14	8	1	—	—	—	—	—	—	23
F. Foremen and others—										
10 and under	5	1 ^a	1 ^a	—	—	—	—	—	—	7
11 to 20	2	1 ^a	—	—	—	—	—	—	—	3
21 to 30	—	—	—	—	—	—	—	—	—	—
31 to 40	—	—	—	—	—	—	—	—	—	—
Totals	7	2	1	—	—	—	—	—	—	10

^a Includes one individual with 15 years' experience as a stoker outside the stone-mason industry.

^b Silicosis.

^c Regarded as non-industrial fibrosis.

Consideration of Table III will show that the group of masons includes all those with advanced pneumonokoniosis, silicosis and pneumonokoniosis, or silicosis complicated by tuberculosis, as well as all those with tuberculosis only, with one exception; this was a sawyer with a healed tuberculous lesion. This fact is attributed to an absence from the smaller groups of men with long service, and, together with the small number in these groups,

will preclude estimation of the rate of development of industrial pulmonary disease among them, although reliable data can be obtained in this respect regarding the masons.

In the estimation of the rate of development, subjects with "slight" fibrosis have been regarded as normal to allow for the effect of age and other factors. Subjects with "moderate" or "advanced" pneumonokoniosis, together with those with true

silicosis and those with fibrosis complicated by tuberculous lesions, have been taken as suffering from industrial disease. Figure I shows in the form of a graph the rate of development of such disease in ten-year periods of employment among the masons examined.

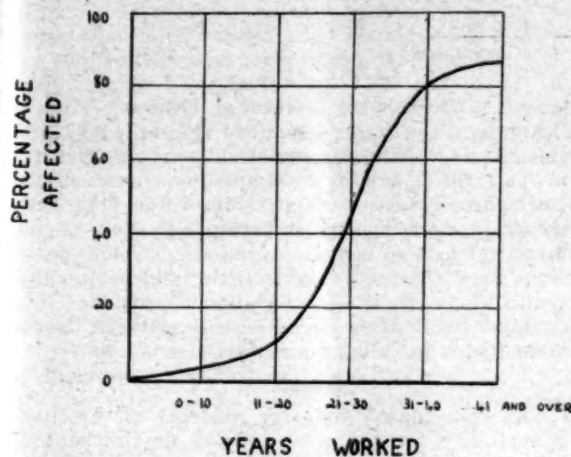


FIGURE I.

Showing the Percentage of Masons Affected by Industrial Disease according to Years of Work.

No case of true silicosis was observed among masons with less than thirty years' service; nine cases in all were detected, one of which was complicated by tuberculosis. This represents slightly less than 9% of the total cases of moderate, advanced and complicated fibrosis diagnosed among the group of masons, and 3.4% of all masons examined.

Active tuberculosis without evidence of fibrosis was found in one case only, or 0.4% of this group of workers. In addition to this case, five masons showed radiographic evidence of healed or latent tuberculous lesions. Tuberculous lesions complicating pneumokoniosis, other than those complicating the case of silicosis already referred to, were observed in four cases, in three of which the lesion was inactive or of doubtful character. The remaining case, in which an active tuberculous lesion was detected, occurred in the group of masons having over forty years' experience.

Among the polishers, while no case of established fibrosis considered to be of industrial origin was noted amongst those with less than twenty years' experience, the group of 10 men with 21 to 30 years'

experience yielded seven such cases, or 70%, which is a higher rate than that shown among the corresponding group of masons.

Influence of Type of Stone Used.

Of the group of 268 masons, 152 had worked among granite for the greater part of their career, while 17 had used sandstone only, and 11 marble and limestone only. The remaining 88 had worked with varying kinds of stone. Table IV shows the rate of evolution of industrial disease among masons according to the type of stone with which they had worked, expressed as the percentage of moderate, advanced and complicated fibrosis, as well as silicosis observed. This is shown graphically in Figure II.

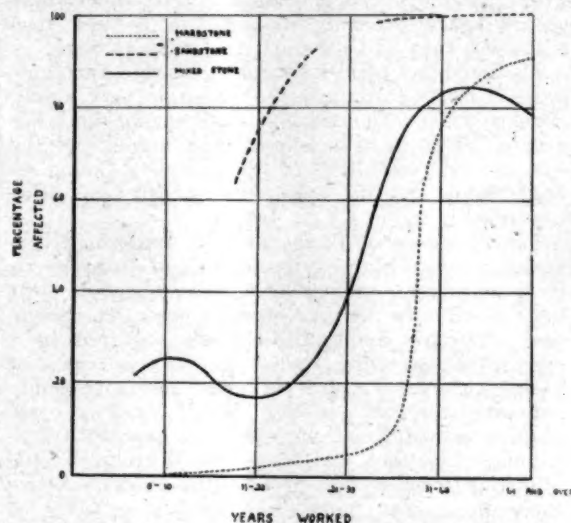


FIGURE II.

Percentage of Industrial Disease among Masons according to Duration of Occupation and Stone Used.

Several points of interest arise from the study of these figures. First, if it is admitted that the second and third groups in the table are small, it should be realized that the final group of mixed experience includes a large number of men who have worked in sandstone. It appears thus that the high free silica content of this stone is responsible for a considerable amount of pulmonary damage, which occurs at an earlier period in industrial life than that caused by work in granite, with its relatively low free silica content. In view of

TABLE IV.

Class of Stone.	Number of Masons Examined.	Percentage of Industrial Disease according to Duration of Occupation.				
		10 years or less.	11 to 20 years.	21 to 30 years.	31 to 40 years.	41 years and over.
Hardstone (granite)	152	NH	1.9	4.8	75.0	90.9
Sandstone	17	NH	75.0	None examined	100.0	100.0
Marble and limestone	11	NH	66.7	NH	NH	None examined
Mixed	88	25.0	17.4	40.0	83.3	78.4

recent discussions as to the causation of silicosis this is of extreme interest.

Furthermore, it was noted that of eight cases diagnosed radiographically as of silicosis only one occurred in a granite worker; the remainder comprised three cases occurring among pure sandstone workers and four occurring among workers on mixed stone.

In all cases of silicosis the lesions were of the coarsely mottled type, believed to be of infective origin, and in three of the cases calcification of the nodules had occurred to a considerable extent. This is comparatively rarely seen among silicotic miners.

In a small number of cases diagnosed as of "moderate fibrosis" faint indications of nodulation were observed. The masons amongst whom these occurred are probably destined to become true silicotics; they had all used sandstone at work.

The incidence of fibrosis among marble and limestone workers, although the group is very small, appears to be very much less than among the other groups. This is to be expected on account of the comparative solubility of this type of stone in body fluids and the negligible quantity of silica contained in it.

The incidence of pulmonary tuberculosis, either healed, latent or active, as well as of tuberculosis complicating an industrial fibrosis, seems to bear little relation to the type of stone used. The single case of active simple tuberculosis occurred in a granite worker; this applies also to two cases of healed tuberculosis, in which the lesion probably antedated the subjects' industrial life. Two cases of pneumonokoniosis complicated by doubtful tuberculous lesions were also found in this group. Among sandstone workers one case of silicosis with active tuberculosis was noted; the remaining cases of tuberculosis occurred among men with mixed experience.

In two cases an abnormal shadow was observed in the radiograph, in each originating apparently from the upper part of the hilus of the left lung and having an almost circular outline. These shadows were dense and might indicate the presence of tumours, although there was in neither case clinical evidence to support this suggestion. The condition is not thought to be attributable, in the present state of our knowledge, to industrial causes, and further investigation was not practicable during this investigation.

Radiographic Evidence of Emphysema.

Emphysema of fairly severe degree was apparent radiographically in what is considered to be a high percentage of cases—26.4% among masons and 13.3% among polishers. Its development appears to be considerably more rapid than that of pulmonary fibrosis, and also appears to bear some relation to length of employment, as Table V will show.

Among the group of polishers the respective percentages of the first three decades of occupation were 12.5, 21.1 and 20.0.

TABLE V.
Incidence of Emphysema According to Duration of Occupation among Masons.

Years Worked.	Percentage of Subjects in which Emphysema was Noted.
10 and under	16.4
11 to 20	21.2
21 to 30	34.4
31 to 40	27.3
41 and over.. .. .	20.7

Radiographic Evidence of Pleurisy.

Among all workers examined, 17, or 4.8%, provided radiographic evidence of old or recent pleurisy in the form of partial or complete occlusion of the costo-phrenic sulcus on one side or the other. Of these, 12 were masons, representing 4.5% of the total number of masons examined. The type of stone used appeared to have little influence on this condition, and it is considered probable that exposure to weather, affecting all workers, is the main factor in causing pleurisy.

Discussion.

The stone-mason industry presents an excellent opportunity for the study of the development of industrial pulmonary fibrosis. Masons are usually apprenticed to the industry at an early age, and many of them spend their whole industrial life in one locality or even in one yard. Moreover, many of them work for the greater part with one class of stone.

Inspection of Table I will reveal the interest that has been displayed in this matter in other countries; it shows a definite and in some cases high incidence of pulmonary fibrosis among stone-masons and other workers exposed during occupation to the inhalation of stone dust, and also an increase above that occurring in the normal population in the incidence of pulmonary tuberculosis.

Comparison of the results of inquiries on a statistical basis is not easy, owing in the first place to varied conditions under which investigations elsewhere have been made, and in the second place to some divergence of opinion on the part of authorities over a period of several decades as to the true relationship between silicosis and other pneumonokonioses.

In the opinion of the writers, true silicosis, caused by the inhalation of a dust with a high content of free silica (SiO_2) and characterized pathologically by the formation in the lungs of fibrotic nodules and radiographically by mottled shadows in the lung areas, is more incapacitating and also of more rapid evolution than a pneumonokoniosis of diffuse type caused by the inhalation of a mineral dust of relatively low silica content. The results of the present investigation have tended to support this hypothesis, apart altogether from discussion as to the possible relationship of true silicosis with tuberculosis or other infective processes.

Inspection of working conditions, coupled with the taking of a series of dust counts, demonstrated

exposure of all craftsmen to the inhalation of fine particles of mineral dust from most of the processes undertaken, as well as from that stirred up by traffic in dry weather. In the majority of instances they are also exposed to weather changes at work. This latter factor would tend to mitigate the danger from dust to some extent, especially when the occupation is compared with underground mining, in which the miners breathe dust-laden air continuously in a closed space. The results of the examinations are in accordance with this line of argument, as the development of industrial pulmonary fibrosis in stone-masons is shown to be slower than that in mine workers.

Of the group of 268 masons examined, 111, or 41.4%, were found by radiography to be suffering from moderate or advanced fibrosis, from silicosis or from some manifestation of tuberculosis, either simple or complicating a fibrosis. Of these, 79, or 29.5%, were found to be suffering from a moderate degree of fibrosis and are not to be regarded as incapacitated. A further five individuals, or 1.8% of the total, were found to have radiographic evidence of healed or doubtful tuberculosis and were not incapacitated.

One case of active tuberculosis was discovered, representing 0.4% of the total. The remaining 26 cases comprised 13 of advanced fibrosis with varying degree of incapacitation, eight of silicosis, two of pulmonary fibrosis with tuberculous complication (one silicotic) and three of pulmonary fibrosis with doubtful tuberculous lesions.

In no case was advanced fibrosis noted when the worker had had less than ten years' exposure, and in only one case was it noted when the worker had had less than twenty years' exposure. No case of established silicosis occurred with less than thirty years' exposure. Among other classes of workers no case of advanced fibrosis or silicosis was observed.

Inspection of the graph (Figure II) makes it obvious that sandstone, with its high free silica content, is the chief factor in causing incapacitation among masons from pulmonary disease, and in particular from silicosis. Marble and limestone workers are very little affected.

Three cases of tuberculosis, either simple or complicating a fibrotic process in the lung, among a group of 355 individuals exposed to siliceous dust at their occupation, a percentage of less than 0.9, are not considered to be excessive when compared with the percentage observed among mine workers for instance. Among 4,076 employees in the mining industry in Western Australia in 1925-1926, 3.5% were found to have silicosis with tuberculosis and a further 0.5% to have tuberculosis only.⁽⁴⁾ These workers are exposed to the inhalation of dust with a silica content higher than that of granite but less than that of sandstone. The occurrence of emphysema in a large proportion of those examined is probably the direct result of dust inhalation causing coughing to expel the coarser particles. It is not considered

to be the cause of serious disability among these workers, although in some cases it may be associated with bronchitis or bronchiectasis. The common occurrence of radiographic shadows indicating recent or old pleurisy coincides with the experience of observers in the United States of America.

Suggestions for Preventive Measures.

Suppression of Dust.

The investigation undertaken shows that stone-masons and their allied craftsmen are apt to contract silicosis and other industrial fibroses of an incapacitating nature during the course of their occupation from the inhalation of dust at work. It has also been shown that the dust of sandstone is more deleterious than that of harder stones with lower free silica content. Therefore the first consideration for the prevention of industrial disease is the suppression of the liberation of dust into the air breathed by workers. The use of water is of some service in this matter, but only to a limited extent; and in metal mines this precaution has not succeeded in reducing the free dust content of the air to a safe standard.

In the coal mines of Great Britain the Hay dust trap, consisting of a flannel bag attached to the exhaust outlet of machines, has been tried with good results, and an apparatus of this description may be attachable to the pneumatic tools used in the stone-mason industry.

The application of exhaust ventilation to the various processes in this industry would probably be difficult or impossible, owing to the size of the objects worked upon. Accordingly, the practice of conducting the bulk of processes under open-air conditions is beneficial to the extent of reducing the amount of dust inhaled, although the exposure to climatic conditions thus entailed may do harm in other directions.

Care should be taken to minimize the amount of dust in any yard by strict attention to cleanliness of plant and person. Impervious floors should be provided where practicable and kept free of dust lying about. The regular sweeping of walls should be insisted on, and change houses, where dust-impregnated clothes can be removed and cleaned, would help in this matter.

In certain dry operations, where there is exposure to large quantities of dust with a high silica content, the positive-pressure helmet is regarded as a necessity; other types of masks are rarely found satisfactory.

Certain processes give rise to far more dust than others, and workers in these processes should be segregated as far as practicable to minimize exposure of other workers on less dusty processes.

Official inspection of stone-masons' working places could advantageously include the periodical taking of dust counts to check general conditions and the various processes.

Supervision of Individuals.

Preliminary medical examination prior to the commencement of apprenticeship or employment in

the industry, followed by rejection of those found to be suffering from tuberculosis or pulmonary fibrosis, is a measure of protection that could be applied with benefit to the stone-mason industry. This has been found advantageous in the mining industry in Australia and elsewhere. The question of periodical reexamination during employment is also worthy of consideration; pulmonary disease could thus be detected at an early stage.

Summary.

1. A clinical and radiological survey has been made of the pulmonary condition of 355 employees in the stone-mason industry in New South Wales, Victoria and South Australia. This has been accompanied by inspection of working conditions and the taking of dust counts.

2. The existence of industrial pulmonary fibrosis of two distinct types was revealed, as well as evidence of other more acute respiratory disorders which may be the result of conditions of work.

3. Of 268 masons examined, 111, or 41.4%, were found to be suffering from pulmonary fibrosis of moderate or advanced degree, or from tuberculosis. This quota comprised 79 cases of moderate fibrosis of the diffuse type, designated as pneumonokoniosis; 13 cases of advanced fibrosis of similar type; eight cases of advanced fibrosis of silicotic type; two cases of pulmonary fibrosis complicated by active tuberculosis; and one case of active tuberculosis only. The remaining cases were of doubtful tuberculous lesions, either alone or complicating a fibrosis.

4. Cases of moderate fibrosis were not associated with incapacitation from work.

5. Of the eight cases of silicosis detected, all except one were found among workers in sandstone, which has a high content of free silica (86% to 95%). Workers handling this stone were found to develop fibrosis earlier and in a more severe form than those using granite or other stones with a low free silica content. The incidence of pulmonary fibrosis in marble and limestone workers is very low.

6. Groups of workers examined, other than masons, including polishers and sawyers, were relatively small; but there is evidence to show the development of industrial disease among these workers.

7. An apparently high incidence of emphysema and old or recent pleurisy was revealed by the radiographs.

8. Measures for the improvement of the health of workers have been discussed.

References.

⁽¹⁾ Report of the Technical Committee of Inquiry to Investigate the Prevalence of Silicosis and Tuberculosis among Stonemasons, Quarrymen, Sawyer-Miners and Rock Choppers; New South Wales Board of Trade, 1924.

⁽²⁾ Records of the International Conference on Silicosis, Johannesburg, 1930; International Labour Office, Studies and Reports, Series F (Industrial Hygiene), Number 13, page 295.

⁽³⁾ United States Public Health Bulletin, Number 137.

⁽⁴⁾ Report on an Investigation of the Pulmonary Conditions of Mine Employees, Western Australia, 1925-1926; Commonwealth Department of Health, Service Publication (Division of Industrial Hygiene), Number 5.

ACUTE CHOLECYSTITIS: A STUDY OF A SERIES OF CASES IN WHICH CONSERVATIVE METHODS OF TREATMENT WERE USED.

By V. M. COPPLESON, M.B., Ch.M., F.R.C.S., F.R.A.C.S.,
Sydney.

31.

THE problem of the management of acute inflammations of the gall-bladder has been debated since 1923. Few controversies in medicine have produced such a divergence of opinion. The problem is complex and the main point of contention has been whether an active policy of early surgical intervention or a conservative one of delay should be adopted. A review of the literature and of the main arguments which have been brought forward will give some idea of this conflict of opinions.

Amongst those who favour delay there has been a variance of opinion upon the extent of delay and the indications for intervention. The delay advocated by some is so short that they cannot be distinguished from the advocates of early operation. Complications have also been added to the controversy by a confusion of definitions. Various interpretations have been given to the meaning of "acute cholecystitis", whilst terms such as "early", "immediate", "delayed" and "conservative" are at times used by different authors with entirely different meanings.

Early or immediate operation has been advocated on the grounds that acute cholecystitis is similar to acute appendicitis and should be treated in the same way. This was first put forward by Walton (1923) and later by Stone and Owings (1933), Heuer (1937) and others. Flint (1933) uses it to support a policy of operation within the first forty-eight hours after onset and of delay if the patient is seen later, aligning it somewhat with the Oschner-Scherren method. Bruggeman (1928) considers that it should be compared with acute salpingitis, in that it rarely kills if treated conservatively. Bergh (1938) points out that the appendix and gall-bladder cannot properly be compared, as they differ bacteriologically, anatomically and physiologically.

Another frequent argument for early or immediate operation is that the incidence of perforation is high and that patients should be operated upon before it occurs. This was advanced by Walton (1923) and later by Alexander (1927), on the basis of twenty cases with a 50% mortality, in which perforation occurred while the patients were being watched. Immediate operation to forestall this complication has been advocated by Touroff (1934), Lipschutz (1935), Wakeley (1937), Mentzer (1936) and others. The contention is supported by the results of several investigations which show that considerable error occurs in the preoperative diagnosis of the pathological condition of the gall-bladder in these cases.

Heuer (1937) has set out very fully the following arguments in favour of early operation: that from

the clinical manifestations it is often impossible to predict the outcome of the disease; that gangrene and perforation occur far too commonly to be disregarded; that the mortality of perforation of the gall-bladder is sufficiently high to be disregarded; and that operation in the acute stage is a less grave danger than that of gangrene and perforation, to which the patient is subjected as a result of conservative treatment.

On the other hand, there is considerable evidence to show that in many cases these pathological conditions are usually not progressive; and some surgeons are of the opinion that the more marked the pathological changes at certain stages, the greater the delay which is indicated. This general tendency of acute cholecystitis to subside is the main argument put forward in favour of delay by many surgeons—Walters (1937), Bergh (1938). Further, although most writers are of the opinion that operations on the acutely inflamed gall-bladder are more difficult and dangerous than those on the chronically inflamed viscus, Glenn (1936) does not find this to be his experience; Totten (1938), on the other hand, found that the morbidity was greater and that secondary operations were more common when operation was undertaken during acute attacks.

Others have used statistical methods. Miller (1930), Zinniger (1932), Glenn (1936) and Graham (1931) quote statistics to show that the mortality is lower when operation is performed in the earlier stages. Wilson and others (1936) claim that these figures do not prove the desirability of early operation. Statistics in favour of delay are given by Smith (1933), Branch and Zollinger (1936) and Wakeley (1935). Figures are quoted by Behrend (1934) to show that the mortality in acute cases is higher than in those in which the inflammation has subsided, and by Ransom and Bergh (1937) to show that conservative treatment is safer than early operative interference.

In general, all surgeons are in agreement that acute perforation must be regarded as an emergency and that operation should be performed as soon as a diagnosis has been made. Apart from this, surgeons appear to fall into the following groups: those who advocate operation if the patient is seen

within two or three days after onset (Taylor, 1936); those who advocate operation in all acute cases immediately after admission of the patient to hospital, irrespective of the time interval after onset (Heuer, 1934); those who, instead of operating immediately, delay for varying short intervals and carry out early operation (Enderlen and Hotz, 1923); those who advocate operation within the first forty-eight hours after onset and delay if the patient is seen later (Walters, 1937, Flint, 1936, Totten, 1938); others (Wilkie, 1937) who delay for forty-eight hours before undertaking operation and, if the symptoms are subsiding, delay for two or three weeks. Other surgeons (Wakeley, 1935, Kunath, 1937, M. K. Smith, 1937) are of the opinion that the problem is too complicated to be handled by any stereotyped policy. Cave (1938) considers that the majority of surgeons can be classed in the group of "early operators", who do not advise operation at once.

The controversy can be dated from 1923, when Walton advocated immediate operation. Early surgical intervention has been advocated by Kirschner (1933), Miller (1930), Stone and Owings (1933), Eliason and McLaughlin (1934), Glenn (1936), Heuer (1934, 1937), Pratt (1933), Finisterer (1935), Lipschutz (1935), Graham and Hoefle (1938) and Totten (1938). Some form of delay has been favoured by Enderlen and Hotz (1923), Deaver and Burden (1926), Bruggeman (1928), Graham (1928), Love (1929), Smith (1933), Behrend (1934), D'Abreu (1935), Cheever (1935), Wakeley (1935), Bass and Bird (1936), Walters (1937), Branch and Zollinger (1936), Wilkie (1937), Ransom and Bergh (1937), Bergh (1938) and Cave (1938). All surgeons who favour delay consider that there are certain indications for early surgery.

For the purposes of a study of this subject I have reviewed a series of patients whose histories are recorded at Saint Vincent's and the Royal North Shore Hospitals, Sydney (inclusive of all cases of cholecystitis, whether acute or chronic and whether operation was performed or not), and who were admitted under my care in a consecutive series, during the period in which the last two hundred operations were performed (Table I). Throughout the series a routine and uniform conservative

TABLE I.
Summary.

Classification (on Admission).	No Operation.	Died.	Operation.	Died.	Total.	Died.
Acute perforation	1	1	1	1	2	2
Obstruction of the common bile duct	6 ¹	1	18	2	24	3
Acute cholecystitis	11 ²	0	38 ¹	0	49	0
Subsiding cholecystitis	1	0	29	1	31	1
Subsided cholecystitis	0	0	36	0	36	0
Chronic cholecystitis	2	0	79	0	81	0
Total	21	2	201 ³	4	223	6

¹ Two returned later for operation, one with obstruction of the common bile duct, the other subsided.

² Three returned later for operation and are included in subsided cholecystitis.

³ Including one operation (laparotomy) for acute perforation.

⁴ Including early acute, persistent and progressive cases.

method of management was adopted. Chronic and subsided cases are included to make the series complete and for purposes of control.

At the outset the main difficulty was one of classification. The determination of what is to be regarded as the "acute gall-bladder" or "acute cholecystitis" is by no means simple. Is it to be determined clinically or pathologically? There is a vast difference between these two conceptions. The results of investigations show that the preoperative diagnosis of the pathological condition of the gall-bladder is highly erroneous. This has been shown by Deaver and Burden (1926) and more recently by Touroff (1934), Heuer (1937), Andrews (1933), Wesson and Montgomery (1937) and Behrend and Gray (1938). Nevertheless, a diagnosis which depends upon a pathological examination after operation can be of little value to the clinician. The same arguments could be applied to acute salpingitis, acute pancreatitis, acute appendicitis, acute intestinal obstruction and many other conditions.

There is, however, a general relationship between the clinical phenomena and the pathological condition of the gall-bladder, although they are by no means parallel. Gall-stones may remain for years in the gall-bladder, producing comparatively few symptoms. When they pass along the cystic duct, obstruct its opening in the gall-bladder or ulcerate through the wall of the gall-bladder, acute symptoms become evident. Their presence in the gall-bladder predisposes it to blood-borne and other infections. Acute cholecystitis varies greatly in intensity, and in the majority of cases the symptoms subside in a few days. Cave (1938) considers that the inflammation will subside in practically 90% of patients acutely ill with clinical manifestations of acute cholecystitis. In the process of this subsidence the clinical signs and symptoms disappear much more rapidly than the inflammatory changes, and weeks may elapse after disappearance of symptoms before the gall-bladder has become quiescent.

An attempt, based on the experience of the patients being examined, has been made to represent graphically (Figure I) the clinical and pathological relationships in these subsiding cases. It would appear that from the first to the fifth day after onset the symptoms in the majority are severe, the signs pronounced and the condition of the gall-bladder one of intense inflammation; from the fourth to the sixteenth day the symptoms and signs rapidly disappear and, although the gall-bladder on examination may be phlegmonous, inflamed or even perforated, its inflammation is in fact subsiding. After the eighteenth day the symptoms and signs usually have disappeared and the inflammatory condition of the gall-bladder has subsided, although it may show some signs of its recent inflammation. These changes may be apparent for a month or even longer. Touroff (1934), investigating this subject, found that "acute inflammatory changes may exist in the gall-bladder of a patient with minimal or absent clinical manifestations at

the time of operation. The pathological changes range from simple acute inflammation to hæmorrhagic, phlegmonous, suppurative and gangrenous inflammation, empyema, perforation and pericholecystic abscesses". Even in the presence of gangrene of the wall of the gall-bladder, mucocoele or empyema, all symptoms can disappear and the process go on to resolution. In one case a mucocoele was found containing clear fluid, nearly four weeks after an acute attack, with the cystic duct still obstructed. In another case, not in this series, at operation performed six weeks after a severe attack the whole wall of the gall-bladder was found to be reduced to the thinness of paper and perforated at many points by the edges of small stones, obviously the result of gangrene during the attack. Yet in spite of this all symptoms had disappeared, and beyond the presence of some adhesions there was no evidence of any abscess formation. Instances such as these are not uncommon, and the inference is that the gall-bladder has a great power of resolution and that the virulence of any infecting organisms must be low. Many surgeons who advocate early operation do so on account of these findings in subsiding cases and consider that the lesions

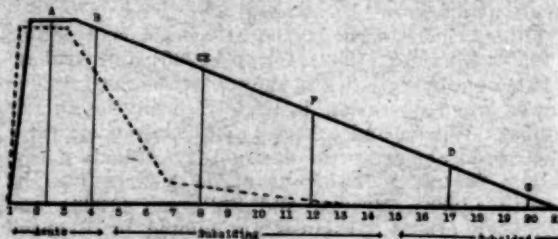


FIGURE I.

Diagram representing the relative clinical and pathological relationships in the subsidence of acute cholecystitis. The pathological condition of the gall-bladder is shown by the straight line; the symptoms and signs by the line of dashes. A: average time of admission in acute cases; B: average time from onset to operation in acute cases; C: average time from onset to operation in acute cases found to be subsiding at operation; D: average time from onset to operation in subsided cases; E: average time of admission in subsiding cases; F: average time from onset to operation in acute cases found to be subsided at operation; G: average time from onset to operation in subsiding cases found to be subsided at operation.

are progressive. There is little evidence to support this, and most of the available evidence seems to indicate that the lesions are merely a stage in the subsidence of the inflammation, which, if left, will go on to resolution. The abscesses met with in these subsiding cases are usually small, the organisms are of low virulence or the abscess is sterile. They behave like any other intraperitoneal abscess of the same type; they are either absorbed or open into a neighbouring viscus. Usually, however, operation is performed before either of these events occur. The incidence of general peritonitis in these cases is extremely rare. Pennoyer (1938), in an investigation of 300 typical cases of acute cholecystitis, found that only one patient developed acute general peritonitis whilst under observation. The disappearance of the symptoms is an indication

that the inflammation is subsiding, although this process of subsidence continues for some weeks after the disappearance of symptoms. In not one of 59 cases in this series in which delay was carried out did any complication occur, and to base early operation upon the fear of such complications seems unwarranted. Further, an analysis of these cases leads to the belief that the inflamed area is better able to withstand operative interference and infection after subsidence of inflammation than when it is acute or is beginning to subside.

Although in the majority of cases the inflammation subsides in this way, in some the symptoms are persistent and the pathological process is progressive. This progression is usually attributed to one or both of two factors, perforation and infection. Two types of perforation are usually described, the acute, in which there is an escape of bile into the general peritoneal cavity, and the chronic, in which the extravasation is limited by adhesions to the area surrounding the perforation. The terminology is the same as that used in gastric ulcer. Sanders (1937), however, uses it in an entirely different sense. Acute perforation is rare, and its causation is discussed more fully later. It is a general belief that acute perforation is secondary to the separation of an area of gangrene in the wall of an acutely obstructed gall-bladder. In those cases in which the abdomen is filled with bile it would seem a corollary that the cystic duct must be free. There is reason to believe that this type of acute perforation is always a primary event, and is secondary to an obstruction of the cystic duct only if actual ulceration of the stone through the duct has taken place. This rarely occurs. There is, however, probably another type of acute perforation which is secondary to an obstruction of the duct. This is referred to later. Chronic perforation, however, may be expected to take place either through separation of an area of gangrene or by ulceration of a stone in the presence of adhesions.

The advent of infection is probably the main feature in determining whether the inflammation proceeds to resolution or becomes progressive. All who have investigated this subject bacteriologically have drawn attention to the frequency of the absence of growth of organisms on attempted culture. Andrews (1933) refers to the finding of sterile bile and gall-bladder wall in many clinically acute cases, and states that the small number of bacteria found was surprising. He states that closure of the cystic duct brings about an infection of the gall-bladder and that eventually the organ sterilizes itself and lies as a functionless viscus without causing harm unless reinfection occurs. The colon bacillus was found to be associated with most post-operative disasters. *Bacillus welchii* was not found in large numbers in any culture. Many of the organisms found were held to represent the normal flora of the liver. Several cases of empyema of the gall-bladder were examined and it was found that the "pus" would not stand up to more detailed

examination. In a later communication Andrews and Henry (1935) suggested that in acute disease of the gall-bladder bacteria played only a secondary role and that other factors deserved more careful study.

Wangensteen and others (1937) found the gall-bladder contents to be sterile in a high proportion of cases, and even when bacteria were present the count was usually low. The biliary passages, when obstructed, appear to be particularly resistant to infection, and it is a common experience to see obstruction of the common bile duct with jaundice extending over many months without the advent of suppurative cholangitis. In acute cholecystitis infection can take place only from bacteria which may be present in the contents or wall of the gall-bladder at the time of the obstruction; from bacteria which travel along the cystic duct, which reach the gall-bladder through the wall of the intestine, by the lymph stream or by the blood stream; or they may be introduced by the surgeon. With the exception of the last mentioned, it is more than probable that infection by the blood stream is the commonest form of infection, and it is suggested, in the absence of more detailed bacteriological data, that when the inflammation remains sterile or is infected by organisms of low pathogenic capacity, the clinical symptoms subside and the pathological conditions go on to natural resolution, even in the presence of chronic perforation or gangrene.

When, however, infection by pathogenic organisms takes place the patient may die, resolution may take place or an abscess may be formed. Clinically, in these cases the patient remains ill and the signs persist. At the present day very few of these patients are left untreated. To find the late effects of these cases it is necessary to turn to a time when little attention was paid to the surgery of the gall-bladder. Mayo Robson (1903), in an Hunterian Lecture delivered in 1898, referred in detail to such abscesses. If the suppuration extends beyond the gall-bladder the pus may make its way through the parietes and an abscess may be found under the right costal margin.

The abscess may burst at a distance from its origin—for instance over the pubes or over the caecum—or it may, after setting up adhesions to adjoining viscera, be discharged into the duodenum, the colon, stomach or pelvis of the kidney or, passing into the liver, it may lead to abscess of that organ, or perforating the diaphragm it may discharge into the pleura and set up an empyema, or into the pericardium and incite pericarditis, or into the peritoneal cavity and produce acute general peritonitis. There are generally peritoneal adhesions which prevent extravasation into the general peritoneal cavity; but the pus may make its way into neighbouring organs.

Chronic perforation or abscess may result in the formation of a fistula. Fistulae are rarely seen in modern surgical practice. Mayo Robson (1903), who had greater experience of them, states:

Many of the fistulae are mere pathological curiosities and only capable of being discovered *post mortem*. Many must form and heal, leaving the patient cured, and thus not only are they not discovered, but they are probably

not even suspected; for contrary to what one might suppose, fistulae between the bile passages and other hollow viscera, in the majority of cases, heal spontaneously, leaving only visceral adhesions; so that the fistulae are comparatively rarely found *post mortem*.

He refers to 43 fistulae which were found in 10,866 *post mortem* examinations.

From these considerations it appears that in acute cholecystitis of the obstructive type acute perforation with general bile peritonitis never occurs, and that in the majority of cases, even if gangrene or chronic perforation has occurred, the process usually subsides. In some of these infection by organisms of low virulence takes place, and infections of this type, too, normally proceed to resolution. Secondary infection, however, by organisms of greater virulence may occur in a relatively small number of cases and results in the death of the patient or the formation of an abscess; both the local and general conditions are persistent or progressive. Fistula formation may take place, but is rare, and operation is usually performed before it is likely to take place. In the subsiding cases the symptoms disappear much more rapidly than the inflammation subsides.

To sum up, it would appear that four primary events may be associated with the causation of acute attacks in patients whose gall-bladders contain calculi, as follows:

1. Obstruction of the cystic duct either by the passage of a stone into the duct itself or obstruction of the opening of the duct by a stone within the gall-bladder. Acute cholecystitis is induced in the gall-bladder by the obstruction and, if it is complete, mucocele or empyema of the gall-bladder occurs. The stone may pass into the common duct. This acute cholecystitis then subsides and the picture changes to one of common duct obstruction. In these obstructed cases subsidence usually occurs; their further course, however, is determined by the presence or absence and the nature of any secondary infection that may take place. Ulceration by calculi may also take place as a secondary phenomenon.

2. Infection of the wall of the gall-bladder by blood-borne or other infection in gall-bladders which are not obstructed. This occurs probably more often than is recognized. In most cases the organisms are of low virulence and the condition subsides.

3. Perforation of the chronic type. There is reason to believe that this may occur as a primary event and may cause either acute cholecystitis with some localized peritonitis, pericholecystic abscess or fistula into the stomach, duodenum or transverse colon.

4. Acute perforation with generalized bile peritonitis. It would seem obvious that in this condition the cystic duct is unobstructed and that the condition is due to ulceration of a stone. The perforation is usually found in the gall-bladder itself. Ulceration of a stone through the cystic

duct, however, may occur; this would cause the condition, but it is rare.

The secondary conditions which may be recognized following the first three of these types have already been discussed. They are subsiding cholecystitis, subsided cholecystitis, abscess, chronic perforation and fistula. Acute perforation secondary to obstruction of the cystic duct can also probably occur. It appears to be extremely rare and is discussed later. Acute perforation with bile peritonitis results in general peritonitis, paralytic ileus and death.

For these reasons and others mentioned later "acute perforation with bile peritonitis" and "obstruction of the common duct" have been classified into separate groups and the following classification has been adopted:

1. Acute perforation with bile peritonitis.
2. Obstruction of the common duct (patients jaundiced on admission to hospital).
3. Acute inflammations of the gall-bladder:
 - (a) Early acute cholecystitis.
 - (b) Persistent and progressive cholecystitis and subphrenic abscess.
 - (c) Subsiding cholecystitis.
4. Non-acute inflammations of the gall-bladder:
 - (a) Subsided acute cholecystitis.
 - (b) Chronic cholecystitis.

In all, the records of 235 consecutive cases were examined; twelve cases were rejected, in which the operation had been performed by other surgeons or in which the diagnosis had not been confirmed. There were no deaths in these 12 cases. The remaining 223 were made the subject of analysis. Among these, 21 patients were not operated upon for the following reasons: operation contraindicated, 3; died without operation, 2; sent to the reception house, 1; operation declined, 7; and discharged for readmission, 8. Of those who were discharged for readmission, five returned for operation and are included. There were thus 218 patients. The classification into the various groups is shown in Table I. The details after classification are shown in Table II, the operations performed in Table III, and certain other details in Table IV. Percentages are not given, as after classification the numbers are too small for statistical purposes.

1. Acute or Free Perforation.

Acute or free perforation occurred in two cases in this series; both of the patients died (Table I). In each case perforation took place before admission of the patient to hospital. One died without operation and the diagnosis was made *post mortem*. The other was not recognized before operation; an emergency operation, however, was performed. In addition to the perforation, the abdomen was found to be full of blood, due to ulceration of the cystic artery.

All published figures show a high mortality rate for acute perforation. The difficulty of diagnosis has been referred to by Mitchell (1928) and Eliason and McLaughlin (1934). The signs and symptoms

TABLE II.

Classification of Cases.

Table showing condition of patient at time of operation, in relation to stay in hospital and operation performed.

Stage of Inflammation at Time of Operation.	Number of Cases.	Duration in Days.			Cholecystostomy.	Cholecystostomy and Cholecholestomy.	Cholecystectomy.	Cholecystectomy and Appendectomy.	Cholecystectomy and Cholecholestomy.	Cholecystectomy, Cholecholestomy and Appendectomy.	Average Stay, Operation to Discharge.	Deaths.
		Onset to Admission.	Admission to Operation.	Onset to Operation.								
Acute ..	8	2-3	1-5	4	6	0	1	1	0	0	27-0	0
Subsiding ..	11	3-0	9-5	12	5	0	4	2	0	0	25-0	0
Subsided ..	19	3-0	13-5	17	0	0	8	8	3	0	21-0	0
Condition subsiding at time of admission.												
Subsiding ..	8	8-0	6-0	12	1	0	4	2	0	1	22-3	1
Subsided ..	21	8-5	10-0	20	0	0	11	8	0	2	21-0	0
Patient jaundiced at time of admission.												
	18	9-5	11-0	21	0	3	1	1	8	5	24-0	2
Condition subsided at time of admission.												
Subsided ..	36	2 weeks to 4 months	3-0	—	1	0	11	18	1	3	22-5	0
Condition chronic at time of admission.												
Chronic ..	79	—	3-0	—	0	0	36	39	0	3	20-5	0

are often vague and misleading, and are apt to be attributed to other abdominal conditions, such as ruptured gastric ulcer, acute pancreatitis or acute intestinal obstruction. Mitchell found that the diagnosis had been made correctly before operation only once in 16 cases. The condition should be suspected in any obscure or vague acute abdominal condition arising in a person known to have gall-stones or whose past history is suggestive of them.

Graham (1928) and Judd and Phillips (1933) were of the opinion that perforation is rare. Figures for its incidence varying between 0.5% and 2.0%

are given by Alexander (1927), Mitchell (1928), Eliason and McLaughlin (1934), Power (1935), D'Abreu (1935) and Graham (1935). Niemeier (1934) found the incidence of free perforation to be 0.57% and of chronic perforation 1.7%. Other authors give much higher estimates—Glenn (1936) 15%, Zinniger (1932) 20%, Branch and Zollinger (1936) 8.8%, Kunath (1937) 25%, and Heuer (1937) 21%. Totten (1938) found the incidence of gross perforation to be 20% and of free perforation 1%. The higher figures given undoubtedly include both the acute and chronic types of perforation.

TABLE III.

Showing Details of Operations Performed.

Operation.	Condition.					Total.	Deaths.
	Acute.	Subsiding.	Subsided.	Chronic.	Admitted with Jaundice.		
Cholecystostomy	10	1	1	—	—	12	0
Cholecystostomy and cholecholestomy	—	—	—	—	3	3	1
Cholecystectomy	13	16	11	36	1	77	1
Cholecystectomy and appendectomy	12	9	18	39	1	79	0
Cholecholestomy	—	—	—	—	1	1	0
Cholecholestomy and cholecystectomy	2	1	1	—	7	11	0
Cholecholestomy, cholecystectomy and appendectomy	—	1	3	3	5	12	1
Cholecystectomy, appendectomy and salpingo-oophorectomy	—	1	—	—	—	1	0
Cholecystectomy and transdiaphragmatic drainage of hydatid of the lung	—	—	1	—	—	1	0
Cholecystectomy and excision of hydatid	1	—	—	—	—	1	0
Cholecystectomy and splenectomy	—	—	—	1	—	1	0
Cholecystectomy and gastrectomy	—	—	1	—	—	1	0
Total	38	29	36	79	18	200	3
Laparotomy for acute perforation	—	—	—	—	—	1	1

TABLE IV.

	Total Number of Cases.	Number.	Percentage
Patients who gave a previous history of jaundice (omitting cases admitted with jaundice) ..	183	34	18.5
History of typhoid ..	217	10	4.6
Diabetic patients ..	217	2	1.0
Previous appendicostomies (excluding sections) ..	217	23	10.6
Previous pelvic operations (100 F.) ..	169	35	20.7
Previous cholecystectomy ..	217	10	4.6
Previous abdominal operations ..	217	68	31.3

It is a common belief that acute free perforation is secondary to an acute obstructive cholecystitis, usually as the result of the separation of an area of gangrene, and many arguments in favour of immediate operation in acute cholecystitis have been based upon it. The evidence appears to be entirely opposed to this view. If it were so, one would expect the clinical picture to be first one of acute cholecystitis, which suddenly changes to that of a perforation. The diagnosis would then not be very difficult and the perforation would occur later in the attack. The reverse appears to be true. Perforation occurs early, usually before the patient's admission to hospital, and diagnosis is difficult. Further, in all these cases the abdomen is filled with bile, and it would seem to be a corollary that, if so, the cystic duct is not obstructed. It has previously been mentioned that acute free perforation would arise from perforation of the cystic duct. This, however, rarely occurs. Most acute perforations are found in the wall of the gall-bladder itself. In one case, not in this series, perforation took place as the result of trauma.

The patient was thrown forward in a tram-car and her gall-bladder area was brought violently in contact with the seat opposite her. The patient, who recovered, was operated upon, and at operation a small perforation of the gall-bladder was found with the sharp point of a stone projecting through it and exactly fitting the perforation.

There is little doubt that acute perforation with bile peritonitis is a primary condition due to ulceration of the wall of the gall-bladder, caused in most, if not all, cases by the ulceration of a sharp stone through the gall-bladder wall. Acute perforation of the cystic or other bile ducts is uncommon. If it occurs, it is likely to be of the chronic type. Perforation of the wall of the gall-bladder in the presence of an obstruction of the cystic duct is almost always of the chronic type, owing to the limited contents of the obstructed gall-bladder and the restriction of their escape into the general peritoneal cavity by adhesions induced by the inflammatory reaction to the obstruction. Although it is undoubtedly rare, acute perforation can occur secondarily to obstruction of the cystic duct, but differs in its character from acute perforation with bile peritonitis, as the following history of a patient at present under treatment shows.

The patient, a woman, fifty-two years of age, was admitted to Saint Vincent's Hospital with a history of severe abdominal pain for four days. Vomiting and pain

persisted in spite of treatment. This was later followed by slight jaundice and some relief of symptoms. Tenderness was present in the right hypochondrium and in the left suprapubic region. At operation the gall-bladder area was exposed and, on examination of the abdomen, a large doughy mass surrounded by adhesions was felt in the pelvis. The rest of the abdomen was free of adhesions, except in the gall-bladder area. The small intestine appeared injected and inflamed. There was no evidence of any gall-bladder—the stomach was firmly adherent to the portal fissure. Below the pylorus there was a firm doughy mass about 5.0 centimetres (two inches) in circumference. On separation of the adhesions laterally and posteriorly a large calculus was palpated in the common duct. The stomach was carefully separated from the liver and common duct, and a small gall-bladder, extremely thickened and not more than 1.25 centimetres (half an inch) in length was found. The stone was removed from the common duct; it was large, with one facet on its proximal side. No trace of the other stone could be found, nor was there any evidence of a fistula into the stomach. The doughy mass below the stomach was carefully opened and was found to contain some small black flakes, suggestive of gall-stone debris, and a small foul-smelling abscess. The mucous membrane was scraped from the small gall-bladder and the abdomen was closed without drainage. The patient had undergone a considerable operative procedure and it was decided to leave the pelvic condition, which was probably a low-grade abscess, to natural resolution or later intervention for drainage if necessary.

It is thought that this case represents one in which the missing gall-stone perforated the gall-bladder and is probably present in the doughy mass felt in the pelvis. X ray examination of the abdomen will be undertaken in the hope of confirming this as soon as the patient's condition permits.

All surgeons are agreed that an emergency operation is indicated in acute free perforation, and cholecystostomy with drainage is the operation usually performed. The condition appears to be unrelated to acute cholecystitis and should be regarded as a separate entity. Acute perforation without bile peritonitis, secondary to an acute obstructive cholecystitis, is probably a very rare condition.

2. Obstruction of the Common Duct.

In this classification the group included under obstruction of the common duct refers to patients admitted to hospital with jaundice or to those who develop it after admission. They form an easily recognizable clinical entity. In this series 24 patients were admitted with jaundice. Eighteen of them were suffering from an acute condition, in four the inflammation was subsiding, and in two instances it had subsided. The eldest was aged seventy-three years and the youngest twenty-six years. All except one were admitted to hospital late in the attack (Table II) and the average duration of symptoms on admission in acute cases was nine days. One patient had been treated in a medical ward for four months and another for thirty-two days. Both were still jaundiced at operation. Of the 24 patients, six were not operated upon at their first admission, in one instance the condition had subsided and the patient declined operation, in two old and feeble patients operation

was contraindicated, one patient died of pneumonia before operation and two were sent out of hospital and returned later for operation. Apart from these two cases, 18 operations were performed on 17 patients.

The average time allowed for subsidence in this group was 11 days after admission, being about 21 days after the onset of the attack. Two of these patients died.

One died 17 days after operation as the result of a streptococcal wound infection.

The other had been operated upon during a previous stay in hospital and cholecystostomy and choledochotomy were performed. He was readmitted seven months later with a history of shivering and vomiting for twelve days and of jaundice. A small biliary fistula was present. Operation was performed ten days later and a stone was found in the common duct. A further cholecystostomy with choledochotomy was performed, but he died on the day after operation.

The third death in this group was that of a patient who developed pneumonia and died six days after admission to hospital without operation.

The operations performed are shown in Table III. Choledochotomy alone was performed on a patient with advanced active cavernous tuberculosis of the lung.

A critical examination of the records of these patients reveals much in favour of and much against delay. The presence of jaundice is not in itself a reason for early operation, as it is well known that in some cases patients can remain jaundiced for long periods without the development of suppurative cholangitis and can be operated upon without serious effect. There were two such cases in this series. There are two main reasons for delay: to give the stone an opportunity to pass out of the common duct in the hope that choledochotomy may be avoided, and to avoid operating upon a jaundiced patient; the other is to allow the pathological conditions present to subside before operation.

In regard to delay for the purpose of allowing the stone to pass out of the common duct, the evidence appears to be strongly against this. Of 20 patients in this series, nine had jaundice at operation. In all of these stones were found in the duct at operation. One who was not operated upon died whilst jaundiced, and stones were found in the duct *post mortem*. In the other ten the jaundice had disappeared at operation. Nevertheless it was considered advisable to perform a choledochotomy on eight of them, and in three instances stones were removed from the duct. It would seem, therefore, that when a patient is admitted to hospital with jaundice the evidence is strongly against waiting for its subsidence, in the hope of allowing the stone to pass, as not only may it remain in the duct for a long period, but also the subsidence of the jaundice is no indication that the common duct is free. Multiple stones may be present. Further, even if the stone has passed, the local conditions found at operation in most cases are such as to induce the surgeon to open the duct. These patients, while the condition is subsiding, also tend to have

recurrent attacks of colic with increases in the depth of jaundice. There is ample evidence that jaundice is not a contraindication to operation.

On the question of delay for the purpose of allowing the pathological condition to subside the opinions of surgeons vary. Walton (1937) considers that it increases the urgency of immediate operation. Usually the attack has been acute for several days before the jaundice appears, the first part of the attack being the result of the stone passing down the cystic duct, with its consequent changes in the gall-bladder. Acute cholecystitis is thus usually present in the early stages, and very pronounced inflammatory changes are found in the region of the cystic duct. These changes tend to increase the difficulties of the operation. The cystic duct may be widely dilated, full of stones and surrounded by adhesions, with considerable fibrosis of the cystic mesentery.

In regard to the operative procedure in these cases, it has been the rule never to place a tube within the common duct. Moderate dilatation of the duct was performed in most instances. Over-dilatation of the duct should be avoided and may be harmful. A recent paper by Branch, Zollinger and Baker (1939) on this subject gives much food for thought. Drainage is of the utmost importance. Any failure of bile drainage is immediately followed by a condition of shock, which rapidly subsides as soon as the flow is reestablished. This occurred in one patient in this series. Two tubes down to the site of the opening in the common duct, one inserted through the upper angle of the wound, the other through a stab wound in the right loin, can often be employed with advantage.

Every case in which jaundice is present should be judged on its merits, and although the majority of surgeons favour some delay, it would appear that the tendency is to delay for too long a period. The problem is different from that of acute inflammations limited to the gall-bladder, and it should be considered separately.

3. Acute Inflammations of the Gall-Bladder.

Acute inflammations of the gall-bladder include: (a) early acute cholecystitis, (b) persistent and progressive cholecystitis and subphrenic abscess, and (c) subsiding cholecystitis.

Early Acute Cholecystitis and Persistent and Progressive Cholecystitis and Subphrenic Abscess.

Forty-nine patients were classified on admission to hospital as suffering from acute inflammation of the gall-bladder. All had had severe pain with tenderness, rigidity and a positive Murphy's sign. In most, but not all, the temperature was raised. The severity of the pain, the degree of tenderness, and the character, persistence or recurrence of vomiting, however, are probably the most valuable guides in the early stages of an attack.

The average time which elapsed in these cases before admission to hospital was about three days. Twelve of the patients were not operated upon at

the time of their first admission. Three were discharged and advised to return later for operation; of these, one failed to return. In two instances operation was contraindicated by advanced general disease; six who were willing to undergo any treatment on admission declined operation when their symptoms subsided. This is also referred to by Cave (1938) and Eliason and North (1939). It has been put forward as an argument in favour of early operation. Of the 37 on whom operation was performed, early or immediate operation was carried out on eight, and in these the condition was very early or was considered to be progressive. No case of subphrenic abscess was encountered in the series. In two cases emergency operation was performed. In one of these a stone had obstructed the cystic duct only four hours before. The gall-bladder and appendix were removed without difficulty and the operation preceded any gross pathological changes in the gall-bladder. This is undoubtedly the ideal treatment, but consideration of the admission times of the series shows that it is extremely rare for the surgeon to see the patient at this stage. The average time of operation in these eight cases was 1.5 days after admission and four days after onset. The stages of the inflammation at which the operation was performed on the patients in this group are shown in Table II and the operations in Table III. The high proportion of cholecystostomies performed is to be noted. The state of the gall-bladder, when acutely inflamed, often forces the surgeon to choose cholecystostomy instead of the cholecystectomy he had hoped to perform. The surgeon is limited in the choice and extent of his operations, his opportunities of dealing with the common duct and the performance of other operative procedures, such as appendicectomy, which can usually be performed with ease and safety when the inflammatory condition has subsided. Cholecystostomy is an unsatisfactory operation, and this limitation of the surgeon's freedom and choice of operation is one of the most important reasons in favour of delay whenever possible. Forty-one of the acute cases were allowed to subside. It will be seen (Table II) that the extent of delay in cases in which operation was performed during the subsiding stage was 9.5 days, making an average of 12.0 days from the onset; in those which had subsided, the average delay in hospital was 13.5 days, or 17.0 days from the onset. Table II also shows that in those patients operated upon in the subsiding stage the proportion of cholecystostomies was considerably reduced and a greater proportion of cholecystectomies were performed, whilst in those whose condition had subsided at operation cholecystectomy was performed in all cases and the operative procedures and post-operative stay in hospital more closely approached the control. There were no deaths in this group. Patients were given morphine for pain, and the greatest attention was paid to frequent hot fomentations to the upper part of the abdomen; these appear to have a great influence on the subsidence of these inflammations. The pathological

condition of the gall-bladder in relation to the symptoms in these cases has already been referred to and is shown diagrammatically in the accompanying graph.

From the data available it would appear that the best results are obtained by delay, if possible for fourteen days or more, although operation within some hours after the attack, especially if it is the first attack, is probably ideal but rarely practicable. In operations before the fourth day cholecystostomy is usually required. Throughout the series the tendency has been increasingly to delay in acute and subsiding cases, even in the presence of a palpable tumour. The two essential features of any acute attack, which have come to be regarded as indicating the necessity for early surgical intervention, are the persistence of acute pain and tenderness, and particularly the persistence or recurrence of vomiting.

Subsiding Cholecystitis.

In this series 30 cases of cholecystitis were classified as subsiding on admission of the patients to hospital. The height of the attack had passed and the signs and symptoms were diminishing. The onset of the attack had taken place on an average of eight days before admission (Table II) and the average delay in hospital before operation was six days in those whose condition was found to be still subsiding, and ten days in those whose condition was found to have subsided. The figures appear to be slightly better for those who were delayed longer. In this group there was one death.

This occurred in the case of a young woman who was operated upon the day after her admission to hospital, six days after onset and before subsidence had taken place. The original operative decision to perform a cholecystostomy was changed to cholecystectomy. This proved unusually difficult. She died two days later.

From the experience of similar cases it was felt that the result might have been otherwise had the delay been greater or had cholecystectomy not been attempted. The death of this patient impressed on me more than ever the wisdom of delay in these cases.

In all cases in this group marked changes were found in the gall-bladder, which was phlegmonous and surrounded by adhesions. There were instances of chronic perforation, abscess, mucocele and empyema. In one case perforation had taken place on the deep aspect of the gall-bladder with the formation of an abscess in the liver bed. The evidence of these cases strongly suggests that these lesions become progressively better the longer they are delayed. If these patients are operated upon during the actual subsiding stage, the main operative difficulties relate to the phlegmonous and friable condition of the gall-bladder, and particularly to the oedema and thickening in the region of the cystic duct. An enlarged and inflamed lymph gland is often found at this site. Operation should, if possible, take place before these changes have occurred or after they have subsided, and for this reason

operation during the subsiding stage should be avoided as far as possible. After subsidence has taken place operation is less difficult or dangerous, and for this reason acute and subsiding cases should if possible be delayed until the eighteenth day after the onset of the attack. If the attack has been slight the period may be shortened. When the attack has been severe longer delay is probably advisable. Table II shows that it was possible to perform cholecystectomy in almost all of these cases.

4. Non-Acute Inflammations of the Gall-Bladder. *Subsided Cholecystitis.*

In the subsided cholecystitis group there were 36 patients, including four who were previously admitted to hospital with very acute attacks and discharged. All had had an acute attack at some time previously, and many of the attacks had recurred over a long period. The most recent attack was from four months to two weeks before admission. The average preoperative stay (Table II) was three days, and the post-operative stay 22.5 days. The operative procedures approached the normal; in one case a hydatid cyst of the lung was drained through the diaphragm and a cholecystectomy was performed, and in another case cholecystectomy and partial gastrectomy were performed. In one case only was cholecystectomy performed.

This was a somewhat remarkable case of a man, aged seventy-one years, who had had jaundice eighteen months previously and a severe attack four months before admission to hospital. This case also throws an interesting light on the fate of untreated chronic perforations. On admission he had upper abdominal tenderness and symptoms suggestive of pyloric stenosis. X ray examination showed delay in the evacuation time of the stomach. At operation the stomach was found to be normal, but there were dense adhesions surrounding the gall-bladder. On separation of these it was found that they closed in a perforation of the gall-bladder, which contained a large stone. Opposite the perforation, and just below the pylorus, caused in adhesions, were a number of gall-stones. These were removed. Owing to the technical difficulty of removal of the gall-bladder and the density of the adhesions, the gall-bladder was opened, the stone was removed and a cholecystostomy was performed.

In another case a stone similarly surrounded by adhesions was found, which had been left at a previous cholecystostomy.

The pathological findings in these cases vary. They merge on the one hand into those found in the late subsiding cases, and on the other hand into the chronic cases. The gall-bladder is usually thickened and surrounded by adhesions. Cholecystectomy can usually be performed.

Chronic Cases.

The group of chronic cases comprises 81 patients, of whom two declined operation, one returned later for operation and is included among the acute cases with jaundice. Many of these cases could probably be classified as subsided, in that the effects of the subsidence of previous attacks are often present, and the majority of these patients had at some time or other had an acute attack. Many suffered from

flatulent dyspepsia or had a qualitative anorexia for certain foods, or certain foods induced an attack. The operative procedure aimed at was cholecystectomy and appendicectomy with a complete exploration of the abdominal cavity. Appendicectomy was performed through the gall-bladder incision in 41 patients. Nineteen had had their appendix removed at previous operations. The common duct was opened in only three cases in this group. Cholecystectomy and splenectomy were performed in one case with acholuric jaundice. Two of the patients were diabetic. The preoperative stay in hospital was in most cases two days, and the post-operative stay varied from 16 to 20 days. There were no deaths in this group.

Further details concerning these patients are shown in Table IV. In patients who had had a previous cholecystostomy the clinical and operative problem is complicated by the previous operation and they should be considered separately. Typhoid fever does not appear to be a very prominent feature in the causation. The high incidence of other previous abdominal operations (31.3%) appears to be too high to be accidental and is worthy of further investigation. Apart from those admitted with jaundice, 34 patients (19%) gave a history of previous attacks with jaundice, acute (six), subsiding (two), subsided (13) and chronic (13). However, it was considered necessary to open the common duct in only 11 cases (6%). In only one patient is it known that a stone was overlooked in the common duct. This patient had a severe attack of pain and jaundice in New Zealand some time after her operation, when, apparently, she successfully passed the stone. Consideration of the cases would seem to show that in patients admitted to hospital with jaundice no good purpose is served by waiting for the subsidence of the jaundice, and that in these cases, even if the jaundice has subsided at operation, the common duct should be opened and explored. A previous history of one or more attacks of jaundice, unless during a recent attack, is not in itself sufficient reason for opening the duct.

In the whole series there were six deaths. Two deaths occurred from acute perforation, which is regarded as a separate entity. There were four other deaths in 217 patients, and three deaths in 200 operations, one patient dying without operation. Three of the deaths occurred among patients admitted to hospital with jaundice, the other in a subsiding case. In 115 subsided and chronic cases there were no deaths. The three deaths among the patients admitted to hospital with jaundice have probably no statistical significance, as it is likely that in two of them death occurred from factors unassociated with the cause of their jaundice. The mortality rates of the whole series, however, is sufficient to show that conservative treatment can be safely carried out in the majority of cases of acute cholecystitis and that death or serious complications rarely occur during the period of delay and subsidence after an attack. Examination of the tables

presented shows that the freedom of operation became greater in proportion to the time which had elapsed since the last attack.

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A PORTABLE ALL-PURPOSE ANÆSTHETIC MACHINE.

By A. DISTIN MORGAN, M.B., Ch.M. (Sydney),
D.A. (R.C.P. and S.),
Sydney.

A PORTABLE anæsthetic machine has been designed which is adaptable to any type of anæsthetic agent or to any technique of administration.

The apparatus consists essentially of two two-stage reducing valves and Heidbrink flowmeters for oxygen and nitrous oxide. A vertical stand mounted on a rectangular base shod with rollers carries four yokes fitted to accommodate two cylinders each containing thirty gallons of oxygen, one containing one hundred gallons of nitrous oxide and another containing cyclopropane. The oxygen and nitrous oxide pass by way of two-stage reducing valves to the Heidbrink flowmeters and the flow is regulated in each case by a single control. The cyclopropane passes direct to the nitrous oxide flowmeter and the flow is controlled by the cylinder valve. As cyclopropane and nitrous oxide have approximately the same density, the same flowmeter is used for both gases.

For continuous use the apparatus can be fitted with the following: (a) ordinary rebreathing attachments; (b) the "closed" form of apparatus with absorption of carbon dioxide by either the "to-and-

fro" method of Waters or the "circle" method; (c) any combination of vaporizing attachments for the addition of chloroform, vinesthene or ether.

For intermittent use the outlet of the machine is fitted with a Heidbrink "automat", a rebreathing bag, corrugated tubing and a face-piece with a spring finger control, which, when released by the patient, closes off the face-piece. With the machine so fitted gases flow into the bag and tubing in the proportions adjusted on the flowmeters till a certain pressure has been built up. On reaching this pressure the "automat" cuts off the supply of gases; this is indicated by the bobbins of the flowmeters, which fall to zero. When the patient opens the valve to the face-piece by depressing the spring finger control and uses the mixture, gases again flow in the original proportions till the pressure rises to the level at which the "automat" is set to cut off the supply. The pressure at which the supply is cut off can be made to vary from three to twenty millimetres of mercury by the adjustment of a knob situated on the top of the "automat". This type of intermittent control can be achieved only by the incorporation of two-stage reducing valves, as the single-stage valves fluctuate widely when set at pressures to give flows suitable for anaesthesia.



Fitted for continuous flow, the machine can be used for all the "closed" or "open" techniques, and as an intermittent flow apparatus it is especially adaptable to anaesthesia or to analgesia for midwifery or dentistry. As the percentages of the gases in the supply do not vary, it is particularly useful for self-administration.

The apparatus, though simple and portable, covers the whole field of inhalation anaesthesia and analgesia, a feature which is not found in any other portable machine.



The weight of the machine is twenty pounds, and with the maximum addition of the four cylinders mentioned above, fifty pounds.

This machine was built to my design by Messrs. A. Charles King Proprietary Limited, of London, and finished in chromium plate.

Reviews.

A HANDBOOK ON DISEASES OF THE SKIN.

In presenting a revised fourth edition of Gardiner's "Handbook of Skin Diseases", Dr. John Kinnear has achieved a noteworthy success.¹ That the late Dr. Gardiner's little book has now run into its fourth edition speaks for its popularity.

Dr. Kinnear has presented his subject in the manner of an accomplished and experienced teacher, and at the same time has provided a book full of sound and up-to-date information for the practitioner. In a small book such as this, a detailed account of the rarer dermatological conditions is not to be expected; however, so good is the arrangement of the matter that a wide survey of dermatology is made possible.

As befits its country of origin, this handbook devotes a relatively large space to cutaneous tuberculosis, and a

¹ "Gardiner's Handbook of Skin Diseases", revised by J. Kinnear, T.D., M.D., M.R.C.P.; Fourth Edition; 1939. Edinburgh: E. and S. Livingstone. Crown 8vo, pp. 255, with illustrations, including 16 coloured plates. Price: 10s. 6d. net.

much smaller space to conditions of special interest to the Australian practitioner, such as the cutaneous effects of our more generous sun. It is interesting to note that Dr. Kinnear, like most dermatologists, has his favourite and much used prescriptions—I.C.T. (Iodine in carbon tetrachloride) and argyrol in dilute solution are evidently well-trying friends.

The paper, printing and illustrations are of the highest grade, and reflect much credit on the publishers. This is a book to be warmly commended to both the student and the practitioner.

FEVERS.

Owing to the inadequate time given to the teaching of acute infectious diseases, and also to the fact that a question on the subject rarely appears on our examination papers, knowledge of fevers often unfortunately leaves much to be desired. There was room, therefore, for a book like "Essentials of Fevers", in which a surprisingly large amount of information is compressed into a small volume.¹ Though perhaps inadequately illustrated, the material is carefully arranged. Chapters on immunity and disease, serum and serum reactions, elementary epidemiology and methods of isolation, together with a chapter on the general examination and treatment of fever patients, are a welcome introduction to the study of the individual infectious diseases. The work is rounded off with a final chapter on miscellaneous subjects, including infectious diseases and the law, mechanical artificial respirations and some useful "do's and don'ts".

In his preface the writer remarks that if the student has mastered the contents of this volume he will embark on practice by no means badly equipped. To this we would agree, and the author is to be congratulated on supplying the student (for whom apparently the book is primarily intended) with such an opportunity to supplement his all too meagre practical experience in this important branch of medicine.

"SCHAFFER'S HISTOLOGY."

An old friend in new guise is provided by the fourteenth edition of "Schaffer's Essentials of Histology".² Those who remember the small brown-covered book of twenty years ago will scarcely recognize a successor in this edition, with its many excellent photomicrographs and its turquoise-coloured linen cover. It would be interesting to be able to compare it with the first Schaffer, issued fifty-four years ago, in 1885, under the authorship of the late Sir Edward Sharpey-Schafer. In the present copy of the book the general character of the earlier editions has been retained; it is still a manual and its divisions are called lessons, not chapters. But the original lessons have been revised and a number of the older illustrations suppressed and replaced by photographs. Modern photomicrography has the power to put new life into a text-book of histology. An innovation in regard to these photographs is the absence of any reduction in size in order to obtain the maximum of detail. We should like to commend especially the lessons dealing with blood corpuscles and the illustrations accompanying them. Such a book as this is intended for students; its treatment of histology cannot possibly be exhaustive, nor are all its statements incontrovertible. The details of cell structure and cellular con-

stituents are still being explored, and our knowledge of them is still far from complete. But this book is an excellent introduction to the study of histology, to the great variety of cellular structure, and the intricate devices of cell arrangement.

BACTERIOLOGY AND BIOLOGICAL CHEMISTRY.

The monograph "Bacterial Metabolism", by Marjory Stephenson, appeared in 1930 as one of a series of monographs on biological chemistry intended to supplement the usual text-books on this subject. There is now to hand a second edition of this publication by the same author.³ She states that the rapid advance of knowledge on bacterial biochemistry has necessitated the complete revision of the first edition and has rendered publication as a monograph unsuitable. The publishers agreed, therefore, to remove the book from amongst the monographs on biological chemistry and to issue it as a text-book in an enlarged form.

This publication affords an excellent presentation of the subject covered by the title. It has a very extensive bibliography and is a valuable aid to the advanced student of bacteriology and biochemistry. It should prove suitable also as a work of reference for the ordinary student of bacteriology, particularly if he is well grounded in chemistry.

In view of the fact that this publication is prepared by a biological chemist, the minor errors in bacteriology which occur can be disregarded and present no difficulty to the bacteriologist. Close study of this text-book will repay the reader well and provide much stimulating food for thought.

Notes on Books, Current Journals and New Appliances.

A HAND-BOOK ON SEX HORMONES.

A most useful hand-book on sex hormones has recently been issued as "Ciba Handbook Number IV" by the Society of Chemical Industry in Basle.⁴ This book is issued to the medical profession only, and is supplied on receipt of a written request to the society's representative in Australia, Box 271 DD, G.P.O., Sydney. The book is divided into four parts. The first is historical; the second is chemical and biological; the third describes special actions of clinical significance; and the fourth deals with treatment. The fourth part will probably appeal most to the clinician; but the first and second and particularly the third parts are of such importance that the whole book should be studied. In the third part the subjects discussed include menstruation, uterine motility, pregnancy, penile erection and mating behaviour, testicular descent, the prostate, the nasal mucosa, action on the pituitary and gonads; this section contains frequent references to the literature. The section on treatment is stated to be an adequate guide to the clinical use of sex hormone preparations; and we think that it is. Naturally, in the "classified indications and suggested dosage" "Ciba's" own preparations are quoted. One of the most useful features of the brochure is the bibliography, which contains upwards of one hundred and sixty references to the literature.

¹ "Essentials of Fevers", by G. E. Breen, M.D., Ch.B., D.P.H., D.O.M.S. (R.C.P. London, R.C.S. England); 1939. Edinburgh: E. and S. Livingstone. Crown 8vo, pp. 286, with illustrations. Price: 7s. 6d. net.

² "Schaffer's Essentials of Histology, Descriptive and Practical, for the Use of Students", edited by H. M. Carleton, M.A., B.Sc., D.Phil.; Fourteenth Edition; 1938. London: Longmans, Green and Company. Medium 8vo, pp. 620, with illustrations. Price: 16s. net.

³ "Bacterial Metabolism", by M. Stephenson, Sc.D.; Second Edition; 1939. London: Longmans, Green and Company. Demy 8vo, pp. 405, with illustrations. Price: 21s. net.

⁴ "The Sex Hormones: A Survey of their Chemical Constitution, Biological Properties and Clinical Applications with a Classified Scheme of Dosage" (Ciba Handbook No. IV); 1939. Switzerland: Society of Chemical Industry in Basle. Demy 8vo, pp. 104, with illustrations.

The Medical Journal of Australia

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All articles submitted for publication in this journal should be typed with double or treble spacing. Carbon copies should not be sent. Authors are requested to avoid the use of abbreviations and not to underline either words or phrases.

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PLUMBISM AND CHRONIC NEPHRITIS IN QUEENSLAND.

As long ago as 1892 A. Jefferis Turner drew attention to the prevalence of lead poisoning among children in Brisbane; and in 1904 J. Lockhart Gibson published in *The Australasian Medical Gazette* a paper entitled "A Plea for Painted Railings and Painted Walls in Rooms as the Source of Lead Poisoning amongst Queensland Children"; he was interested particularly in the occurrence of ocular neuritis. In 1914 Breinl and Young wrote on the occurrence of lead poisoning amongst north Queensland children. It was not until 1929, however, with the publication of papers in this journal by D. G. Croll and L. J. J. Nye, that serious attention was paid to the possible association of plumbism and chronic nephritis. The papers of Croll and Nye were important contributions and will well repay study, even in these days. In April, 1930, the Commonwealth Department of Health was asked by the Queensland Branch of the British Medical Association to investigate the subject, and in 1932 it issued an interim report by R. W. Cilento. In this report there appeared the statement that a very strong chain of circumstantial evidence incriminating lead was recorded in the special

series of cases considered and that indications in any other direction were extremely few. At the same time it indicated that further investigations were necessary before conclusive findings could be stated. In August a further paper by Nye, with comments on the interim report, appeared in this journal; and in the same year Nye published his book on the subject. (This book was reviewed in this journal on March 24, 1934.) The Commonwealth Department of Health has now issued from the School of Public Health and Tropical Medicine a "service publication" entitled "Plumbism and Chronic Nephritis in Young People in Queensland". This brochure consists of a report by Dr. R. Elliott Murray, and includes details of a method for the estimation of lead in biological materials by Dr. Murray and I. F. Stephens.

Though readers of this journal are probably well acquainted with the Queensland nephritis problem, it will be useful to draw attention to the statistical facts as set out by Murray. At the present time about 90 people below the age of thirty years and approximately the same number between the ages of thirty and fifty years die annually in excess of the number that would succumb to the disease were the death rates the same as those of England and Wales. The death rate below the age of thirty years is approximately the same as it was from 1917 to 1926, but above that age it has been steadily tending to increase. During the same period the total death rate from chronic nephritis at all ages has increased from an average of 403.5 to 558 per million of population *per annum*; that is, the death rate below the age of thirty years has shown a relative but not an absolute fall in comparison with that at later periods of life—from 25% of the total to 18%. Murray points out that whatever factor is responsible for the abnormal incidence in young people, acts with greatest intensity in Brisbane, where the death rate below the age of thirty years is more than one and a half times as great as the corresponding rate for Queensland as a whole. In other words, approximately half the deaths from chronic nephritis occur in Brisbane, although the city contains only about a third of the population of the State.

At the outset of Murray's investigation it became apparent that it was necessary to have available a sensitive test for lead in biological materials. The method which was elaborated is described in detail in the second part of the brochure. It is based on the work of Fischer and Leopoldi, who first described the colorimetric method for the estimation of lead, making use of its property of forming a cherry red compound with diphenylthiocarbazone, commonly known as dithizone. This method was used for the estimation of the lead content of urine, blood, soft tissues and bone. In all, 175 cases were investigated. Of the 175 persons, 81 were suffering from chronic nephritis, hypertension and albuminuria; 42 suffered from plumbism or probable plumbism, and 52 either suffered from other conditions or were normal persons.

One of the sections in the report is headed "Does Plumbism Occur in Children in Queensland?" Murray shows beyond doubt that it does. Of 25 children listed as "definite cases", 13 were boys ranging in age from one year and nine months to fourteen years; 12 were girls whose ages varied from three years and nine months to eleven years. The group of cases described as "indefinite" were those of 14 children; in these instances the diagnosis, although probable, was not regarded as being firmly established. The account of the investigations undertaken in all these cases is full of interest. Details cannot be given in this place; and those who are interested in this aspect will study the report in detail; attention, however, must be drawn to three interesting skiagrams typical of those found. In the long bones in 12 out of 19 cases well-marked lines of increased density were found running parallel to the epiphyseal lines at the wrist and knees. Murray does not think that the results of X ray examination are clear cut, since other influences which can affect bone growth have to be excluded before the results can be attributed to lead. He states, at the same time, that it is tempting to expect that, with sufficient knowledge of the factors concerned, it might be possible to read in the skiagraph the history of the child's exposure to the poison. Investigating paint as a source of lead, Murray found that paint which retained its

glossy hard surface would not yield any appreciable amount of lead on being rubbed with saliva-moistened fingers. On the other hand, when the paint had become weathered the danger rapidly became serious. Slight rubbing with dry fingers would yield easily estimated amounts of lead; wet fingers removed more; and if the tips of two fingers were moistened with saliva (as a child might do in handling the paint) and lightly rubbed over the surface, amounts of the order of one to two milligrammes became available for ingestion if the fingers were sucked. After quoting various authorities on the amount of lead necessary to cause symptoms, Murray concludes that the amounts found by him would be sufficient to cause symptoms if ingested by a child. He makes the interesting observation that a weathered paint containing a low percentage of lead may yield more lead on being rubbed than a paint containing a higher proportion of lead but remaining in a better condition. He records observations on this point in a table, and suggests that the 5% limit to the lead content of paint for veranda railings, gates and fences, as enacted in 1923, may still allow dangerous amounts of the material to become available to children after weathering has occurred. In spite of these observations the number and severity of cases of plumbism have decreased in recent years. Murray quotes the many possible reasons put forward by Nye for this reduction in incidence; and he concludes that of them possibly the most potent factors are education, the better care of children and the changed conditions of paint.

The most important section of Murray's work is that in which he discusses the question "Is Plumbism a Factor in the Causation of Chronic Nephritis in Queensland?" He has no conclusive evidence to offer. He does, however, point out that among 38 subjects of mild plumbism there were fourteen with slight kidney involvement. This, he states, would seem to indicate that kidney damage is to be feared as a sequel in these cases, even if they are only mild in type. The amount of kidney damage could not in the majority of cases be considered severe or warrant the diagnosis of nephritis; but in

Murray's opinion they appear significant when taken in conjunction with the series investigated by McCann, and quoted by Cilento, in which 19 persons out of 28 who had suffered from plumbism were found to be nephritic. Murray also refers to the figures given by Nye—29 out of 34 persons who had been affected by plumbism being found to be the subjects of nephritis. He also refers to the views of many writers on this subject, and discusses such other possible factors as scarlet fever, lead in drinking water, and climatic effects. His discussion in this regard of the work of Duguid on the experimental production of nephritis with irradiated ergosterol is most interesting. Murray points out quite rightly that in the investigation of this problem it is necessary to keep firmly in mind that any factor to which the increase in nephritis in young persons is attributed must be shown to act with special reference to Queensland. In another part of his report he has pointed out that the special factor or some additional factor would need to be operative in Brisbane more than in other parts of the State, a fact which adds considerably to the difficulty of the problem. His general conclusion may be stated in full:

From a consideration of the past history of cases of nephritis and the later progress of cases of plumbism, together with the results of biochemical examination of nephritis cases, the evidence suggests that lead poisoning in childhood is a major factor in the causation of the abnormal Queensland incidence of chronic nephritis. Although it would appear possible that it is the sole factor responsible, it cannot be stated dogmatically that such is the case. It would appear probable that any other factors which can cause renal damage could act in conjunction with lead to aggravate the condition. The role of climate, with its possible effects on acid-base balance and mineral metabolism, cannot be accurately assessed, but, whilst it may act as an adjuvant to other sources of renal damage, there is insufficient evidence to allot to it a major role.

On the available evidence Murray could have come to no other conclusion; and many will agree that some factor other than lead may be operative. It is so easy to believe that lead is the only factor that we must be quite certain before we say dogmatically that this is so. It may be useful to remember the investigations reported by S. A. Smith in this journal in 1925 on the subject of absorption of lead by miners at Broken Hill, when

he concluded that the absorption of a small daily dose of lead over a long period of years did not necessarily produce any disease or tissue damage to arteries or kidneys. Be that as it may, Murray has by his extensive piece of work carried the investigations into this peculiar condition a stage further; and in the doing of it he has enjoyed the cooperation of medical practitioners, of hospital and university authorities and of both Commonwealth and State health departments.

Current Comment.

THE CONTROL OF MALARIA.

Ross's discovery of the insect vector of malaria aroused the hope that at last a solution of the malaria problem was at hand. The problem is far from being solved. There are numerous species of anopheles, and they have varied breeding habits; the means employed in the destruction of the breeding place of one species may actually encourage the breeding of another. Further, many species are not natural vectors, their habits not bringing them in frequent contact with man; they are not of much importance in the spread of malaria; their extermination is unnecessary and measures aimed at their extermination are uneconomical. From time to time engineering works of greater or less magnitude have been undertaken in attempts at the control of malaria, and there can be little doubt that where funds are available they are ideal. But few governments are wealthy enough to attempt such works on a large scale; besides, money is too often claimed for less useful but more spectacular operations. So it is that in various rural communities measures have been devised for the utilization of natural processes in limiting or preventing the spread of malaria. These are known as naturalistic measures. They depend on a knowledge of malarial epidemiology, the bionomics of anopheles and in many cases of fish and other creatures, special economical problems of the individual community, the effects of topographical changes *et cetera*. They are of incalculable importance. Under the authority of the Health Committee of the League of Nations, L. W. Hackett, P. F. Russell, J. W. Scharff and R. Senior White have recently investigated and reported on naturalistic measures as employed in various countries.¹ Their communication is of great general interest and is worthy of close study by all concerned in the preservation of public health in malarious communities. They mention two instances of naturalistic control that has developed almost accidentally. A large marshy area known as the Orti di Schito, in the delta of the River Sarno,

¹ Bulletin of the Health Organisation of the League of Nations, December, 1933.

near Pompeii, has been converted into numerous small gardens, intersected by canals; the fresh water in these canals is not suitable for the breeding of the important vectors of malaria in southern Europe, and the only anopheles to breed there are species that seldom attack man. Conditions that at first glance appear to be ideal for the spread of malaria may be actually inimical to it and should not be disturbed. In the year 1740 automatic gates were installed in a canal joining a coastal lagoon to the sea at Viareggio. They allow fresh water to flow out when it rises in the lagoon, but prevent the entrance of salt water. The object was the prevention of malarial miasma that was believed to be produced by the rotting of organic material in brackish water. The eventual result was the virtual disappearance of malaria, because the dangerous anopheles of those parts are not adaptable to breeding in fresh water.

Naturalistic methods are divided into chemical, physical and biological. The first includes the pollution of water and change of the salt content of water, as measures directed against the aquatic stages of the insect, and the creation of repellent barriers of odorous plants and the administration of drugs to produce odorous sweat, against the adult insects. Physical measures include filling, sluicing, flooding, shading or clearing, drying, muddying *et cetera*, against the aquatic stages, and destruction of shelters, creation of plant barriers to flight *et cetera*, against the adult insects. Biological measures include the introduction of natural enemies, change of the flora and fauna *et cetera*. It is impracticable to discuss all these measures here. We shall mention merely a few of the more striking features of the report.

The following is quoted from the section dealing with the salt content of water:

Non-interference with natural conditions which prevent anopheline breeding should also be stressed. Mangrove swamps in Malaya and elsewhere are malaria-free so long as they remain in their natural condition, in which there is free tidal access. The effect of salt is so closely linked with movement of tides and penetration of larva-eating fish that this is one of the best examples of combined action working to reinforce a particular naturalistic method.

An example of the damage that can be done by interference with such natural conditions is the outbreak of malaria that occurred at Falmouth, Jamaica, after a swamp had been divided into two by the obliteration of a channel. The swamp that had been closed to the sea became almost dry. Later, heavy rains came and flooded it. As a result, in a population of 8,000, there occurred 4,400 cases of malaria and 138 deaths. When salt water was readmitted the vector (a fresh-water breeder) disappeared.

Some species of anopheles are unable to breed in water polluted with sewage or sullage; others in water contaminated by decaying vegetation. On the other hand, *Anopheles umbrosus* breeds in shaded jungle pools of peat water, and *Anopheles multicolor* in village cesspools. Both of these are known vectors of malaria. In some places breeding

of the local vector has been discouraged by the use of green vegetation, which is trampled into streams or pools. Care has to be taken in the selection of plants for the purpose, as some are poisonous to fish and other fauna as well as to mosquito larvæ. Use may be made of muddy streams to fill swamps, old quarries *et cetera*. During past centuries streams bearing flood waters from the Apennines have been periodically diverted into large areas of swamp, where silt is deposited by stagnation. In this way great pieces of land have been reclaimed and made healthy. On a smaller scale similar results have been obtained in other parts of the world.

An important measure in malaria control is sluicing. The water of a stream is dammed and allowed periodically (once a week as a rule) to escape, when it rushes down the channel as a turbulent wave, destroying or stranding any pupæ or larvæ in its path. There are certain objections to the method; for example, erosion of soil and the encouragement of breeding above the dam.

Fluctuation in the level of impounded water is of some value in the prevention of mosquito breeding. When the level falls, larvæ and protective floating material are stranded and aquatic plants affording protection to larvæ are destroyed by drying. These facts are made use of in the Tennessee Valley, where each dam is so constructed as to allow for a so-called "malaria surcharge". Intermittent drying of irrigation channels or the periodic use of alternative channels is an obvious procedure in the prevention of mosquito breeding. Another interesting method is the agitation of the surface of water. Mosquitoes require still water to lay their eggs in; also larvæ cannot survive in water that is in constant agitation. Irrigation pools may be fed by water that splashes into them from a height, causing constant movement of the surface. In Birmingham, Alabama, the Tennessee Coal, Iron and Railway Company actually sent launches round lakes with the object of creating waves to destroy larvæ and strand floating material. Some anopheles breed in stagnant water, others in moving water only. For the elimination of the first the water may be made to flow; of the second, the stream may be changed to a series of pools. Some species of anopheles breed only in shade, others in sunshine. The clearing of land may destroy some and encourage others. Attempts have been made to reproduce jungle conditions to discourage the breeding of those species that prefer sunshine; but they have met with no great success.

Among biological measures the introduction of larvivorous fish and the changing of the flora and fauna are discussed. *Gambusia* is the most important fish that has been deliberately used in the extermination of mosquito larvæ. There is scarcely a malarious country into which this fish has not been introduced. In only one instance is there a record of any ill effects produced by it. In Italy it is said that *gambusia* interferes with fish culture by eating the fry of *cefalo* in coastal lagoons.

The encouragement of the growth of certain kinds of algae in salt-water ponds in Java has resulted

in the virtual extermination of anopheles larvæ (which are unable to penetrate the surface film of algae) while permitting the continuance of fish culture, for which the ponds were constructed. But changing the flora is not always a safe method of attack; it may actually encourage the breeding of more dangerous species. Of naturalistic measures directed against the adult mosquito, the only one regarded by the authors as of much importance is that of "deviating certain anopheline species from man to animals, which are their preferred hosts".

It is apparent that the prevention of the breeding of anopheles is no simple matter. Every locality has its special problems. These are the more complicated where they involve a consideration of the maintenance of such necessary activities as agriculture and pisciculture. It is useless to rid a locality of malaria if in the process the inhabitants are robbed of their means of livelihood. Where there are several anopheline species a knowledge of their bionomics is essential; for the destruction of one may result in the disastrous multiplication of another. This report carries a lesson for everyone, not merely the public health officer.

BLEEDING PEPTIC ULCER.

THE general consensus of opinion seems to be that patients with peptic ulcer complicated by hæmorrhage should be treated by medical rather than by surgical means. Surgical operation in bleeding peptic ulcer is likely to be successful only if the bleeding point can be secured, and this is not easily done. Even the most intrepid surgeons hesitate before operating on account of hæmorrhage from a peptic ulcer, and very few will undertake the task unless hæmorrhages have been severe and frequent, and possibly unless some other urgent complication, such as perforation, is present. Discussion thus centres around the type of medical treatment that should be used. Medical treatment has usually consisted of starving and of adherence to what is known as the Sippe diet. In 1935, however, Meulengracht, of Copenhagen, published a paper in *The Lancet*, in which he advocated a liberal diet from the outset in the treatment of patients with bleeding peptic ulcer, and satisfactory results have been reported from its adoption. In support of his views Meulengracht stated that exhausted patients often died after hæmorrhage in spite of careful dieting, that sometimes protracted hæmorrhage ceased when the patients were given food, that it was doubtful whether a patient should be starved just when he was most in need of sustenance, and that it was doubtful whether it was desirable that the stomach should contain no food but only free gastric juice. He thought it improbable that a diet deficient in calories and vitamins was ideal as a means of promoting the healing of ulcers. Meulengracht gives alkalis with his diet, and the diet is both more liberal and more varied than that advocated by Lenhart many years ago.

G. C. Turnbull and J. H. Sagi, in a recent communication,¹ point out that Schiødt, writing in *The American Journal of the Medical Sciences* in 1936, confirmed Meulengracht's work and showed that when his diet was used regeneration of red blood corpuscles and of hæmoglobin occurred more rapidly than when the old methods were used. Turnbull and Sagi have studied the records of eighty patients suffering from peptic ulcer and gross hæmorrhage admitted to the Evanston Hospital, Illinois, during the ten-year period 1928 to 1937 inclusive. These 83 patients formed 16.3% of 489 patients suffering from peptic ulcer. It is important to point out that the majority of the 83 patients were private patients and that their economic status was above the average; they had "sufficient intelligence to realize the importance of adhering to the regimen prescribed". Possibly in no other condition is it more necessary to have the intelligent cooperation of the patient than in peptic ulcer. Their average age was 43 years. Of the 83 patients, 77 received medical treatment only, and in the present discussion attention will be confined to these. In order to determine the effect of prolonged starvation on the duration of hæmorrhage, the authors divided their patients into two groups. In one group of seventeen patients who were starved for an average of 4.7 days, hæmorrhage lasted for an average of 23.4 days. A second group was without food for an average of one day, and bleeding lasted for only 7.8 days. An attempt was made to evaluate the effect on duration of bleeding of prolonged alkalization and restriction of the diet to milk and cream. It was found that patients whose diet was radically restricted for more than five days (an average of 12.2 days) had hæmorrhage for an average of 17.2 days, while those limited to milk and cream for five days or less (average of 2.5 days) had hæmorrhage for an average of only 10.5 days. The beneficial effect of early and relatively liberal feeding was shown by eleven patients who received a soft diet immediately or were started on a puréed diet after only two days of milk and cream. These had bleeding for an average of only 4.5 days, as compared with an average of 13.5 days for eighty patients. In contrast, eleven patients who had been made to fast and were then kept on milk, cream and alkalis for an average of 19 days, had hæmorrhage for an average of 24 days. In order to test the suggestion that the patients with the most severe hæmorrhage might have been starved for the longest time, blood counts were made of both groups on the admission of the patients to hospital and very little difference was found. This series of patients is admittedly small, but it serves to demonstrate the results that may be expected from careful supervision and early feeding of an intelligent sufferer from peptic ulcer. In support of early feeding in the presence of hæmorrhage the views of Cave may be quoted; he stated that gastric and duodenal rest was not obtained by starvation, since the blood in the stomach acted as a peristaltic stimulant.

¹ *The American Journal of Digestive Diseases*, April, 1939.

Abstracts from Current Medical Literature.

MEDICINE.

Hypertension.

G. FREEMAN AND G. HARTLEY, JUNIOR (*The Journal of the American Medical Association*, September 24, 1938) report hypertension in a patient with a solitary ischemic kidney. It is known that hypertension develops in dogs and monkeys when one kidney is made ischemic by the partial clamping of its artery. The case reported is that of a man, aged fifty-seven years, who had the right kidney removed in December, 1935, on account of its laceration through a fall. Histological examination of the kidney revealed massive hemorrhage but no other abnormality. The patient recovered and remained well for sixteen months, during which period several normal blood pressure readings were recorded. In April, 1937, he began to have headaches and nausea. Two months later his systolic blood pressure was 230 millimetres of mercury. From that time on his blood pressure remained high, between 220 and 270 millimetres of mercury systolic, and 140 and 170 millimetres diastolic. He died in December, two years after the nephrectomy, of myocardial failure. Necropsy revealed a large heart, and atheroma with ulceration in the abdominal aorta. The orifice of the left renal artery was obstructed by an atheromatous plaque extending seven or eight millimetres distally into the vessel; the orifice was thus narrowed so that a probe could be inserted into it only with difficulty. The left kidney weighed 200 grammes and contained several retention cysts, with white areas on the surface, one or two millimetres in diameter, containing purulent material; the cortex was six to seven millimetres in thickness; a slight resistance was found when the capsules were stripped, and a few slightly granular areas were found beneath the capsule. Microscopic examination of the kidney revealed changes in the small and middle sized arteries of the kidney, mainly thickening of the intima and muscular coats; there were no changes in the arteriolar walls. The interstitial tissue contained scattered areas of polymorphonuclear cells and lymphocytes, with a few small abscesses. Arterioles in the perirenal and periprostatic tissues and in the pancreas and spleen were much hyalinised. Arteriolar changes elsewhere in the body contrasted with the lack of changes in the kidney. The man was thought to have had a normal blood pressure before his accident, and he had fairly normal renal function three months before death. The pathological changes in the kidney were not sufficient to account for the hypertension, most

of the renal damage being due to pyelonephritis, which had supervened on cystitis. The unusual arteriolar thickening in the perirenal and periprostatic tissues and in the spleen and pancreas were similar to the changes found in dogs following clamping of a renal artery. It was thought that the changes in dogs resulted from increased pressure throughout the arterial system, except in the kidney, where the pressure was probably decreased by the narrowed renal artery. The case recorded represents the type of hypertension that occurs when ischaemia of a kidney is mechanically produced.

Bronchial Fistula.

A. BENOIT, L. CANNONE AND L. MARÉCAUX (*Revue de la Tuberculose*, January, 1939) report two cases of pyothorax with bronchial fistula persisting despite treatment long after thoracoplasty, in which closure of the fistula soon followed the wedging of a crayon of silver nitrate into the bronchial opening. The authors also recommend strong solutions of silver nitrate for preliminary irrigation of the pyothorax; they have used solutions of 35 parts of silver nitrate per centum and have found that this method effects speedy reduction in the size of the pleural pocket.

Erythema Nodosum.

J. ARNAUD (*Revue de la Tuberculose*, January, 1939) found that intracutaneous injections of tuberculin protein produced recrudescence of erythema nodosum in persons suffering from this disease. Injection of the protein into one of the lumps, however, showed that there was local energy at the site of the eruption. Injections of a lipid fraction of tuberculin were without effect.

Protein in Nephritis.

J. D. S. CAMERON (*Edinburgh Medical Journal*, June, 1939) states that there is no need to be afraid of protein in the treatment of any stage of nephritis, and that except at the onset of acute nephritis it is not justifiable to reduce protein intake to the minimum. Until comparatively recently the kidney has been treated with such respect that the body has been allowed to die around it. He maintains that in the starvation treatment still adopted by some no essential amino-acids are given; the tissue proteins are thus broken down without being replaced and consequently there is a deterioration of the body's general state and a lowered resistance to infection. The patient is rendered more liable to intercurrent infection and yet the kidney is called upon to excrete as much urea as when a limited amount of protein is permitted to allow for tissue replacement. The author refers to experimental evidence in support of the contention that high protein feeding has no deleterious effect on

the kidney. The author tries to keep the protein diet as high as possible consistent with the functional ability of the kidney, as evidenced by the urea concentration range.

Serotherapy and Chemotherapy in Pneumococcus Pneumonia.

MAXWELL FINLAND, WILLIAM C. SPRING, JUNIOR, FRANCIS C. LOWELL AND JOHN W. BROWN (*Annals of Internal Medicine*, May, 1939) discuss specific serotherapy and chemotherapy of pneumococcus pneumonia, and report on the results of treatment in their own cases with specific anti-pneumococcal serum, with sulphanilamide and sulphapyridine ("M and B 693"), and with the serum-drug combination. They direct attention to the important contributions that have been made in recent times in the introduction of the Neufeld technique in type diagnosis directly from the sputum, in the bacteriological classification of the pneumonias, in the improved potency, standardization and estimation of dosage of the anti-pneumococcus horse and rabbit serum. Among patients treated by serum, in Type I pneumococcus pneumonia the mortality rate was 19%, as compared with a 40% mortality among those not treated by serum. Similar figures are given for Type II pneumococcus pneumonia. In the case of Type V pneumococcus pneumonia the reduction of the mortality rate with the use of serum was more evident, a mortality rate of 40% being reduced to 10%. The mortality rate in Type VII pneumococcus pneumonia was lowered from 29% to 12%, and in Type VIII pneumococcus pneumonia from 25% to 10%. The study of the use of sulphanilamide by the authors has been confined to cases of Type III pneumococcus pneumonia, and they were not able to report any sharp reduction in death rate. Their published results in the use of sulphapyridine with and without the combined use of specific serum in various types of pneumococcal pneumonia indicate that both specific serum and sulphapyridine are effective agents and that the combination of the drug and specific serum is effective in reducing the fatality rate in the cases in which the mortality is the highest. They have noted a more rapid clinical response among patients treated with adequate doses of good type-specific serum than following the exhibition of sulphapyridine alone; and further, they state that when adequate doses of both are employed the drug can be dispensed with from twelve to thirty-six hours after the initial dose, when evidence of recovery of the patient is commonly manifest. The main untoward effects observed in the use of sulphapyridine were nausea, vomiting, moderate anaemia, cyanosis and impaired renal function. On the present available data on the treatment of patients with acute pneumonia, the authors recommend adequate bacteriological control before

serum or drug is administered, serial examinations of the urine and estimations of the blood count and blood urea content during the administration of sulphapyridine, the initial use of sulphapyridine in all cases as soon as the diagnosis of pneumonia is established, and the administration of type-specific serum in patients over forty years of age, and in all cases in which the blood culture yields specific types of pneumococci. The treatment with adequate amounts of serum helps to ensure complete and rapid recovery with recrudescence. The authors consider that uniformly beneficial results from the use of specific serum are obtained only when the serum is highly potent, free of any but the milder reactions, and is used in adequate amounts.

Sodium Sulphapyridine.

E. K. MARSHALL AND P. H. LONG (*The Journal of the American Medical Association*, April 29, 1939) describe the results of the intravenous use of sulphapyridine, which is the name used in America for "M and B 693" or 2-(p-aminobenzene sulphonamide) pyridine. The sodium salt is more soluble than this preparation, which has a solubility in water of 1 in 1,000. The sodium salt is alkaline in reaction. The authors found that in animals doses of 0.5 gramme per kilogram caused convulsions and death; smaller doses were less toxic, and 0.1 gramme per kilogram caused vomiting in only one animal. Concentrations of 20% strength given rapidly by the intravenous route caused considerable fall in blood pressure and decrease of respiration; 5% solutions given slowly produced no such ill effect. Thirty patients were later treated by intravenous injections of 5% sodium sulphapyridine in sterile distilled water, at the rate of five cubic centimetres of solution per minute. This solution was nearly isotonic; 3.8 grammes was the standard dose for adults. For a patient weighing 65 kilograms this was equivalent to 0.005 gramme per kilogram. The only ill effects noted were vomiting during or immediately after the injection. This treatment was used for patients with severe pneumococcal pneumonia, who were being treated with sulphapyridine orally, and in whom the concentration of the drug in the blood was too low, or because of urgency or severe vomiting. One or two intravenous doses were given at six to twenty-four hour intervals. By this means the concentration of the drug in the blood was raised to nine to eighteen milligrammes per 100 cubic centimetres. If the solution escaped into the subcutaneous tissues a bad slough resulted. Sulphapyridine by mouth was given in doses of one gramme every four hours, coincidentally with intravenous therapy. To patients mildly or moderately ill with pneumonia four grammes of sulphapyridine were given by mouth at once, followed by one gramme every four hours until

the temperature had been normal for at least forty-eight hours. The dose was then reduced to one gramme every six hours until resolution of the pneumonic process was well under way, at which stage 0.6 gramme was given four times a day until the lungs were clear. The most effective concentration of the drug in the blood was probably about four milligrammes per 100 cubic centimetres.

Prophylaxis against Streptococci.

E. D. HOARE (*The Lancet*, January 14, 1939) discusses the case for prophylaxis with sulphanilamide and "M and B 693". Mice had been protected against intraperitoneal injection of hæmolytic streptococci by a single dose of "Prontosil rubrum". Further investigations were conducted on the same lines. Single doses of 10 milligrammes of sulphanilamide delayed death in mice subsequently injected with streptococci; 30 milligrammes caused dangerous symptoms, but all the mice survived. "Prontosil rubrum" and other "Prontosil" preparations were toxic to mice and were not persisted with. "Proseptasine" afforded little protection. "M and B 693" given subcutaneously in doses of 30 milligrammes three hours before infection afforded complete protection. Oral administration was less effective. A single dose of "M and B 693" gave protection to a much greater extent than sulphanilamide. The bactericidal power of the blood of patients who received 0.5 to 1.0 gramme of sulphanilamide thrice daily, was tested by Hoare's method. All patients were found to have a high bactericidal power in the blood from one to twenty-four hours after receiving the first dose of the drug. Similar results were obtained when patients were given 1.5 grammes of "M and B 693" thrice daily. These results indicate the value of prophylaxis against streptococci, especially when large doses of "M and B 693" are used. Similar dosage in human subjects would mean giving 70 grammes to a patient weighing 70 kilograms. This dose would be far too large. It is suggested that one gramme of sulphanilamide or "M and B 693" should be given thrice daily before labour and during labour for three or four days; similar prophylaxis is suggested for surgical conditions in which risks of infection with streptococci are suspected.

Hodgkin's Disease with Cutaneous and Cerebral Manifestations.

A. S. L. RAE (*Edinburgh Medical Journal*, June, 1939) records a case of Hodgkin's disease associated with cutaneous and cerebral manifestations in a male patient, aged fifty-one years, who suffered from intense generalized pruritus. The skin over the face and in the flexures was dry, dull red, scaly and thickened, but otherwise the physical examination revealed no abnormality. The patient was under

observation for two years, during which time progressive deterioration of the general bodily state was noted; the pruritus persisted uninfluenced by local and general therapeutic measures; irregular fever occurred, but did not conform to that of the Pel-Ebstein syndrome. In the later stages ptosis gradually developed on the left side, with proptosis and a complete oculo-motor nerve palsy. The patient died in coma, prior to which he had exhibited two attacks of acute mania accompanied by convulsive seizures lasting for five minutes and one hour respectively. Clinical examination and special investigation by the author throughout the patient's illness did not reveal abnormal findings apart from the progressive emaciation and the cutaneous and eye lesions. Serial blood counts revealed a relative lymphocytosis, but there was no enlargement of the spleen, liver or superficial lymph nodes. Necropsy revealed an absence of fat in the subcutaneous and deeper structures of the body, enlargement of the abdominal aortic glands but not of the thoracic glands, enlargement and congestion of the spleen and liver, atrophy and congestion of the kidneys, and oedema of the brain. Numerous small firm white nodules were present in the spleen and liver; and in the hilum of the left kidney there was found a larger nodule which had invaded the kidney and renal vein. A flat mass of soft pinkish tissue was found within the skull, projecting from the base on the left side, involving the left third and fourth cavernous sinus, and occupying the back of the left optic nerve but not invading it or the eyeball. Microscopic examination of the nodules in the viscera, the hilar mass in the left kidney and the tissue from the orbital region revealed lymphadenomatous structure. The author comments on the rarity of lymphadenomatous deposits within the skull, the obscurity of the actual causation of the convulsive seizures, and the relative frequency of cutaneous manifestations in Hodgkin's disease.

Persistent Purulent Effusion following Pneumothorax.

P. LÉFÈVRE (*Revue de la Tuberculose*, April, 1939) has treated several patients suffering from persistent purulent effusion following artificial pneumothorax with intrapleural injections of a 10% solution of quinine and urea hydrochloride. Injections of from five to twenty cubic centimetres were given every few weeks after aspiration of the fluid, and were followed by clearing of the effusion and rapid obliteration of the pleural space. In none of the cases reported were tubercle bacilli found in the pus. The author has also injected the same solution into tuberculous sinuses with very encouraging results, but notes that the injections cause severe burning pain for some minutes.

British Medical Association News.

SCIENTIFIC.

A MEETING of the New South Wales Branch of the British Medical Association was held on May 18, 1939, at the Royal Prince Alfred Hospital, Sydney. The meeting took the form of a number of clinical demonstrations by members of the honorary staff.

Embolism.

Dr. ALLAN WALKER presented three patients as illustrations of some of the clinical varieties of embolism. The first showed a massive and primarily aseptic embolism in the lung, probably with some mild secondary infection. The second illustrated a septic embolism in the elbow due to pneumococcal metastatic infection following pneumonia. The third patient was suffering from an unusually prolonged general staphylococcal infection, which had, after the common fashion among children, metastasized in bone, but which had been slow in maturing into a definite surgical osteomyelitis; the lesion was still undergoing periodic exacerbations, during which the systemic symptoms were repeated, though with lessened intensity.

Dr. Walker's first patient was a male, aged forty years, who had been admitted to hospital complaining of a severe attack of breathlessness that had occurred four days previously, accompanied by pain across the front of the chest. The patient had gone to bed feeling well, and had awakened during the night with intense shortness of breath, which was acute for about fifteen minutes. Later in the night he felt pain across the chest, sharp and aggravated by breathing. He had lost most of his pain by the time he was admitted to hospital with a provisional diagnosis of lobar pneumonia. He gave a history of breathlessness on exertion since childhood, and was subject to palpitation, though he had been able to work hard up to that time. Occasionally he had a breathless attack at night. There was no history of rheumatic fever, but he said that he had had pneumonia a year earlier.

Examination revealed moderately increased respiration and pulse rates. There were diminished resonance, weak breath sounds and moist râles at the base of the right lung. There was also a small area where pleuritic friction sounds were heard. The heart was enlarged and its rhythm slightly irregular. There was no undue filling of the veins of the neck, nor any cyanosis or obvious distress. A presystolic murmur of varying intensity was heard at the apex of the heart. The temperature was hardly elevated above normal, and the question was raised as to whether the patient had had an abortive pneumonia. In favour of this, his sputum was found to contain many pus cells with pneumococci (none of Type I, II or III), streptococci and influenza bacilli; but the leucocytes numbered only 6,700 per cubic millimetre, 68% being neutrophile cells. An X ray examination of the chest revealed a greatly enlarged cardiac shadow; the curves of the pulmonary artery and the left auricle were exaggerated, suggesting an advanced mitral lesion. There was an irregular shadow at the base of the right lung, suggesting a consolidation with small effusion. It was thought more likely that the pulmonary lesion was an infarction, a supposition strengthened by the sudden onset with dyspnea. Dr. Walker said that clinically the most interesting feature of this patient's case was the question as to whether his cardiac irregularity was due to auricular fibrillation or not. This aspect was thoroughly discussed with a student class, and in spite of the demonstration of variations in blood pressure and in heart sounds and uneven spacing of beats it was difficult to decide whether this might be due to sinus arrhythmia with occasional extrasystoles. The electrocardiogram next day revealed an obvious fibrillation of the impure flutter variety. It seemed likely that he had had a pulmonary infarction secondary to the cardiac lesion; but it was probably

seldom that auricular fibrillation, usually so manifest and simply recognized, caused such a difference of diagnostic opinion. It was evident too, on examination of the heart, that it was still fibrillating. The condition in the chest was clearing up slowly; this process was not accelerated by the considerable constant pulmonary congestion.

Dr. Walker's second patient, a male, aged thirty-eight years, a motor car driver, entered hospital after having suffered from pain in the chest and cough for twelve days. The onset of the illness was rapid, with recurrent rigors; severe pain in the right side of the chest followed within a few hours. The illness ran the usual course of lobar pneumonia, with pronounced consolidation of the right lower lobe, and the patient was making good headway until on the seventh day of his illness his right elbow became swollen and painful. On admission to hospital his general condition was much better, but the arm was very painful and swollen and movement at the elbow joint was difficult. The lower half of the right lung presented signs of consolidation with many râles. A blood count gave the following information: erythrocytes numbered 4,380,000 per cubic millimetre and the haemoglobin value was 83%; there were 17,450 leucocytes per cubic millimetre, of which 87% per neutrophile cells. There was a pronounced shift to the left. No organisms were grown on attempts at culture from the blood. An X ray examination of the chest some days later revealed dense shadows, chiefly at the right base; these were thought to be due to resolving pneumonia. An X ray examination of the arm revealed no evidence of bone necrosis or septic arthritis. Progressive leucocyte counts revealed a constant leucocytosis; the arm became more swollen and tense, and a fortnight after the patient's admission to hospital it seemed definitely fluctuant, though aspiration through an exploration needle yielded no fluid. Three days later an incision was made and a quantity of thick pus was evacuated. Cultures were made from this pus and a pure growth of pneumococci was found. By this time radiological examination revealed septic arthritis of the elbow joint, with considerable destruction of the articular cartilages.

Dr. Walker said that the patient's condition had steadily improved since that date. The lesion in the lung had cleared up and the wound in the arm had healed. Dr. MacMahon had applied a plaster to the limb in a position of flexion with a window which allowed continuous dry heat from an electric light globe to be applied, and the end-result was resolution with ankylosis. Dr. Walker remarked that this patient had been very ill at first, and considerable anxiety was then felt as to the possibility of further metastasis or of an extensive destructive lesion in the affected arm. He had seen one similar case in which the ankle was infected by the pneumococcus, and in this case amputation became necessary. Considering the frequency of pneumonia, such metastasis must be very uncommon.

The third patient shown by Dr. Walker was a boy, aged fourteen years, who had been in hospital eight months. He had been admitted with a history of pain in the left groin and back of five days' duration. His left hip was sharply flexed and was painful to move, but no swellings or extreme local tenderness were observed, though there was some tenderness on pressure in the groin and over a few enlarged glands in this region. He was pale and looked extremely ill; in fact he presented the picture typical of a severe systemic infection, and clinically was considered to have septicemia. A week later blood culture resulted in a growth of hemolytic staphylococci, and it was evident that the patient had the not uncommon staphylococcal blood infection associated with focalization in bone. After about six weeks an X ray examination revealed osteomyelitis in the region of the left hip joint and involving the upper part of the ischium. Two months later there was slight but definite destruction of the articular cartilage. The acetabular region was involved in chronic inflammatory changes, which slightly improved, but gave evidence of persistent necrotic activity. Radiographically little change had occurred up to the time

of the meeting. Blood counts had revealed some secondary anaemia and a considerable leucocytosis, the number of leucocytes varying from 10,000 to 16,000 per cubic millimetre, though at times the leucocyte count had been normal. The erythrocyte count had altered but little from the region of a little over 4,000,000 cells per cubic millimetre. The boy had been placed on a Jones abduction frame and kept immobilized, as it was found that even during quiescent periods of his illness any attempt at movement reactivated pain and caused a rise in temperature. Otherwise, in spite of very great improvement in his general condition, he had had a number of relapses in which his temperature was much elevated, again with concomitant signs of systemic disturbance. The boy's illness was not of unusual type, but there were two points of interest. One was the relatively long period of illness that followed an extremely severe initial stage, when he appeared likely to die, with numbers of exacerbations, but without any definite sign of a lesion requiring surgical intervention. Dr. Walker remarked that that was not really unusual, but it had given an opportunity for observation of the second point, the results following the use of "Uleron". This drug had been used at the outset, 0.5 gramme being given every four hours, and had been given on repeated occasions since for periods of several days and then suspended for several days. Whenever an exacerbation had occurred it had been given again, and the clinical impression had been gained that a pronounced improvement had followed each administration. The drug had been withheld at intervals, but its resumption seemed definitely to have favoured remission. A point which might be argued in favour of this treatment was that as the drug had been employed at times when it was presumed that general blood spread of infection had occurred, it was possible that its use had discouraged the tendency of the staphylococci to become implanted in other foci. The general outcome of what was a dangerous instance of this type of infection had so far been encouraging.

Lung Abscess.

Dr. A. J. COLLINS showed a male patient, aged forty-four years, who had had pain in the right side of the chest, with blood-stained sputum, five months previously. He had had a slight cough for four years; but he had been in his usual health until five months earlier, when he was struck in the face by a piece of a circular saw and lost part of a tooth. Seven days later he suffered from severe abdominal pain and was treated for cholecystitis; three days afterwards he developed "influenza", with blood-stained sputum, and two weeks later he had a haemoptysis, losing one pint of blood. Since then he had had several smaller haemoptyses. Pain was continuous; it was situated along the right border of the sternum and the right axilla; the patient had a continual cough, with large quantities of purulent sputum; the cough was worse in the morning. Breathlessness on effort had been present for five months. He had lost one and a half stone in weight in six weeks.

The patient had undergone appendicectomy two years earlier. There was nothing of note in his family history and habits.

Several radiological examinations were made. On December 7, 1935, the radiologist reported appearances typical of tuberculosis. On December 16, 1935, and on January 1, 1939, February 10, 1939, and March 24, 1939, lipiodol was instilled. It was seen that a bronchus in the upper lobe was blocked, and the radiological diagnosis was carcinoma of the lung. On May 9, 1939, after a similar examination, the lesion was reported to be less extensive than on March 24, 1939. Bronchoscopic examination revealed pus and granulation tissue in the right upper lobe bronchus. A piece of tissue removed at biopsy was considered insufficient, but no evidence of carcinoma was seen. The sputum contained pus cells and large numbers of streptococci, but no tubercle bacilli.

Physical examination revealed that the apex of the right lung moved slightly less than the left; movement at both bases was equal. The percussion note was impaired over the right upper lobe. The trachea was felt entering

the chest to the right of the mid-line. The breath sounds were broncho-vesicular over the right upper lobe and frankly bronchial at the right apex; otherwise they were vesicular. Vocal resonance was increased in the right upper lobe. The sputum was copious and purulent. No abnormalities were detected in the other systems.

Dr. Collins said that the interest in this case lay in the conflict between the evidence supplied by clinical and radiological methods. By radiology a blocked bronchus was revealed proximal to an opacity which resembled that caused by malignant disease; after clinical examination a diagnosis of abscess was favoured. There was a swinging temperature, and the trachea was felt entering the chest towards the side of the lesion. Any deviation of the trachea should have been away from the lesion if malignant disease had been present. The patient solved the problem by coughing up a pint of pus within half an hour. This occurred within the first month of his stay in hospital and was followed by rapid improvement in health and a gain of over two stone in weight in three months. At the time of the meeting there was still a small amount of mucopurulent sputum; but the patient's physical improvement was continuing, and there seemed no reason to believe that a neoplasm was present. The cause of the abscess remained unknown.

Coarctation of the Aorta.

Dr. Collins's second patient was a male, aged twenty years, who had been quite well until nine months previously. At that time his heart suddenly "jumped" after a swim. The palpitation became worse and the patient had to remain in bed. One week later "something went" in his heart and he became very breathless and collapsed. The palpitation grew worse and gradually gave way to heaving in the chest. In February, 1938, the patient was admitted to the Royal Prince Alfred Hospital, and two weeks later he was transferred to the Prince Henry Hospital for three weeks. He then returned home and remained in bed. An appendicectomy performed six weeks prior to his admission to hospital was followed by one week's normal convalescence; but then the palpitation returned and was worse than before. Great weakness and lassitude were also present. The patient had a feeling of fullness in the epigastrium after eating only a little food, and he also had some difficulty in swallowing. He had lost two stone in weight in three months. He had had no previous illnesses, and his mother, father, two sisters and two brothers were alive and well. There was no cardiac trouble in the family.

The patient was a motor mechanic. He did not drink or smoke. The Wassermann test and the Kline test elicited no reaction. A blood count gave the following information: the erythrocytes numbered 4,750,000 per cubic millimetre, the haemoglobin value was 92% and the colour index 0.9.

Physical examination revealed pallor, but no cyanosis. Pronounced bounding pulsation of the great vessels in the neck was present, and there was visible pulsation in the transverse scapular, lateral thoracic and internal mammary arteries. Capillary pulsation was present in the nails. The apex beat was visible in the sixth intercostal space, five inches from the mid-line. A systolic thrill was palpable over the aortic area. Pulsation of the aortic arch was palpable in the suprasternal notch. The femoral pulse was barely palpable. Auscultation of the mitral area revealed that the second heart sound was of normal intensity; the first sound was replaced by a soft blowing systolic murmur. Auscultation of the aortic area revealed a typical to-and-fro murmur. The pulse rate was 68 per minute; the pulse was regular in time and amplitude, except for occasional missed beats. The pulse wave was of the "water hammer" type, with rapid rise and fall. No abnormality was detected in the other systems.

Dr. Collins remarked that the diagnosis in this case was easy to arrive at by clinical methods. To begin with, a high blood pressure in a young man should immediately suggest coarctation. When this elevation of blood pressure was found to be confined to the upper limbs, the diagnosis was almost certain. When the patient was first seen his

systolic blood pressure in the upper limbs was 210 millimetres of mercury, whilst his diastolic blood pressure was too low to be measured. Under rest in bed his systolic blood pressure gradually sank to 160 millimetres of mercury. He had, of course, an associated aortic regurgitation. As the silhouette of his aorta was normal, it had to be assumed that the coarctation was due to a shelf of *tunica intima* encroaching upon the lumen of the aorta.

Transverse Myelitis.

Dr. Collins next showed a male patient, aged twenty-seven years, who had been admitted to hospital complaining of paralysis of the legs and of incontinence of urine. Seven weeks earlier he had caught a bad cold; soon afterwards he found that he could not pass urine and that it dribbled away from him continuously. About one week later weakness developed in the knees and spread up and down the legs. At the time of the meeting the patient was both anaesthetic and paralysed below his waist. He knew when his bowels were about to act, but had no control over them at all. No symptoms were detected in any of the other systems.

The patient had had asthma since childhood, and gonorrhoea one year previously. Nothing of note was elicited in his family history or habits. There was no response to the Wassermann test or the Kline test. On October 24, 1937, a radiological examination had been made after instillation of lipiodol. The lipiodol was partly arrested for twenty-four hours at the level of the tenth thoracic vertebra, with a few drops arrested a few inches higher up. On November 1, 1937, the patient had large bed sores. On December 1, 1937, a periurethral abscess was drained. On December 20 his condition was improving and there was some movement in the legs. On January 5, 1938, slight subjective sensation was returning. On April 3, 1938, the bed sores were almost healed. The bowels were still very difficult to move, and the bladder filled and emptied automatically. Some wasting of the right leg was detected. On September 24, 1938, the patient was able occasionally to open his bowels normally if the motion was not constipated. On November 3 a discharging sinus on the right hip was opened and curetted. On February 6, 1939, the power of movement was improving slowly but surely. On April 25 the patient's movements were slightly spastic and not quite so good as before. On May 16 the movements were still improving.

Physical examination revealed that the psychical functions were normal, as was the speech. The cranial nerves were all intact. The right leg was much weaker than the left, but very little wasting had occurred. Both legs were spastic and hypertonic. Sensory examination revealed that both legs were anaesthetic below the malleoli; the sensations of touch and of pain were much delayed in the lower two-thirds of the leg. The reflexes were tested and the following results were obtained: the conjunctival, pupil and palatal reflexes were present on both sides; the epigastric and abdominal reflexes were absent on both sides; the plantar reflex was extensor in type; the knee and ankle jerks were exaggerated on both sides; ankle clonus was present on the right side and absent on the left side. The patient had incontinence of overflow of urine and the bowels were not open naturally.

Dr. Collins said that, to begin with, this patient had practically a complete transverse lesion of the cord. At the time of the meeting he had an upper motor neurone type of paralysis of the lower limbs; but he had regained practically complete control of his sphincters. He was still improving. It was interesting to see a patient with such severe myelitis recover.

Juvenile Gout.

PROFESSOR C. G. LAMBE showed a patient suffering from juvenile gout. The patient was aged nineteen years and had erythronoclastic anaemia of obscure origin. The patient had been born jaundiced and had suffered intermittently from jaundice since birth. Gout supervened at the age of fourteen years, and tophi were now present in the neighbourhood of joints and on the ears. The spleen was enlarged and the liver slightly enlarged. The anaemia

was macrocytic and orthochromic; the fragility of the erythrocytes was normal and there was no family history of jaundice or anaemia. The Wassermann test elicited no reaction. A bone marrow cell count showed that there was a relative increase in myeloblasts and myelocytes of the granular series; but the number of leucocytes of the blood was usually within normal limits, although it occasionally rose to 13,000, with a relative increase in the percentage of eosinophile cells. Removal of the spleen caused some improvement as regards the anaemia and the gout, but the jaundice, after disappearing for a time, returned after three months. The changes in the spleen differed from those observed in acholuric jaundice, but bore a greater resemblance to those seen in hepatolienal fibrosis. Numerous eosinophile cells were seen scattered throughout the pulp; but there was no abnormal infiltration with myelocytes.

Professor Lambie regarded the condition as possibly an exceptionally chronic form of leuco-erythroblastic anaemia, in which the erythroblastic reaction had fallen into abeyance while the erythronoclastic process had continued to dominate the picture, causing jaundice and anaemia. The gout might have been secondary to the blood dyscrasia.

Bronchiectasis.

DR. KEMPSON MADDOX, from the Medical Professorial Unit, arranged a demonstration of patients and material concerning bronchiectasis. He explained that the professorial unit would probably prepare each year a similar demonstration, relative to some well-known and frequent disorder. He considered that such an innovation would probably be of more interest to the general practitioner than the exhibition of patients afflicted with rare diseases.

The demonstration was arranged similarly to those covering a wider field which were prepared for undergraduate instruction. The material demonstrated consisted of the following: (a) three patients suffering from basal bronchiectasis, each complaining of a different presenting symptom, namely, haemoptysis, cough or pleural pain; (b) radiographs illustrating types of the disease and the value of contrast bronchography; (c) museum specimens of lungs affected with bronchiectasis; (d) miscellaneous exhibits, such as sputum from patients with bronchiectasis, devices for assisting inhalation of drugs, foreign bodies removed from bronchi, photographs of clubbed fingers *et cetera*; (e) a bronchoscope and accessories suitable for bronchoscopic lavage and suction, demonstrated by Dr. A. O. Davy; (f) a series of wall charts.

Dr. Maddox then went on to speak of the incidence of bronchiectasis. He said that severe cases were not nearly so common in Australia as in Europe, but mild cases were fairly common and were often overlooked unless suspected and searched for by contrast radiography. Of 100 patients, 52 were males, and 77 were under the age of thirty years (Farrell). Eighty of the 100 patients dated their symptoms from their first decade.

Referring to aetiology, Dr. Maddox said that the worst cases occurred among malnourished children, with poor racial or hereditary resistance. Predisposing factors were: (a) poverty, avitaminosis, imperfect "tissue soil", and (b) infection of the upper part of the respiratory tract (86%).

The precipitating factor was pulmonary collapse; this could follow (a) bronchial obstruction by a foreign body, blood clot, neoplasm or mucus *et cetera*, or (b) bronchopneumonia, especially that complicating measles, whooping cough, inhalation of infected material. Pneumonia involving interstitial tissue, for example that due to *Bacillus influenzae* or *Streptococcus hemolyticus*, was a particular cause of pulmonary collapse.

With regard to diagnosis, Dr. Maddox said that the patient's colour and nutrition were often normal. Clubbing of the fingers was common. The sputum was purulent and offensive (40% cases), but not necessarily profuse. Basal pleuritis produced occasional pain. Certain postures relieved the cough, others increased it. Chest deformity might or might not be present. The local physical signs were weak breath sounds, relative loss of resonance and

coarse râles, often hard to find and very localized. The clinician should suspect a chronic "juicy" cough with halitosis, and also a history of several attacks of pneumonia. Contrast radiography was essential; 10 to 20 cubic centimetres of iodized oil should be instilled through the trachea, or through a laryngeal tube or bronchoscope. A plain X ray film failed to reveal shadows behind the heart or liver. Diagnostic bronchoscopy was required in all cases, especially recent cases, and was of therapeutic value; it excluded the presence of a foreign body or a neoplasm. A microscopic examination of the sputum should be made for organisms, spirochetes, elastic tissue, blood cells *et cetera*. Antral "wash-outs" were essential; they were the "acid test" for sinusitis.

With regard to the pathology, Dr. Maddox said that increased negative pleural pressure produced bronchial dilatation in a collapsed lobe (dry bronchiectasis), which was probably reversible in the early stages (Lander and Davidson). Infection followed, the walls of the cavity ulcerated, interstitial tissue increased and held the lobe permanently collapsed. The condition was progressive; bouts of interstitial pneumonia came and went suddenly. There were two types, saccular and cylindrical. In 100 cases the left lung was affected in 41 cases, the right lung in 23 cases, and both lungs in 36 cases.

Dr. Maddox then spoke of medical treatment. He said that drugs were of little use, vaccines were of no use, artificial pneumothorax, thoracoplasty and crushing of the phrenic nerve were of no use. By way of deodorants creosote could be given by mouth or on a Burney-Yeo mask. Deep-breathing exercises were contraindicated. Postural exercises were useful; the head could be hung down in a selected posture and a posture bed could be used. "Carbogen" relieved the cough. Bronchoscopic dilatation, lavage and suction were the best medical measures.

Referring to surgical treatment, Dr. Maddox said that it was necessary to treat radically any infection of the upper part of the respiratory tract. Lobectomy offered the only chance of cure for a young and sufficiently fit individual with lobar disease, preferably unilateral. The mortality rate of the operation was decreasing in expert hands; it was 80% ten years earlier; in 1936 Edwards had an average mortality rate of 14% among 13 patients; in 1937 Churchill had an average mortality rate of 6.1% among 49 patients, and Churchill had an average mortality rate of 2.6% among his last 38 patients. Bilateral lobectomy and pneumonectomy were now practised.

Dr. Maddox then discussed, in order of frequency, complications of bronchiectasis and causes of death. He said that bronchiectasis was a progressive disease. There were recurrent pneumonic episodes, especially in childhood. Hemoptysis might be very severe. Right-sided heart failure might occur in the fourth or fifth decade in extensive fibrotic cases. Cachexia or lardaceous disease might occur. Cerebral abscess and infective arthritis were uncommon.

The prognosis was best in the "dry", uninfected form, recognized only by bronchography in non-tuberculous hemoptysis. The prognosis depended on the extent of the disease and the toxæmia; the lesion was inexorably progressive.

Dr. Maddox then said that prevention was the most important aspect of all. It should be noted that 80 out of 100 patients dated their symptoms from their first decade. The essential steps in prevention were the following. The first was satisfactory child nutrition, a major social problem. The second was care of children with poor resistance during attacks of measles, pertussis *et cetera*. Pertussis vaccine and convalescent serum for measles should be used. The third step was the expenditure of every effort to prevent collapse or to reinflate a collapsed lobe after bronchopneumonia. Adequate convalescence in good surroundings was essential in "unresolved pneumonia". Carbon dioxide and diathermy should be used, and sinusitis should be attended to. The fourth step was the use of measures to prevent post-operative pneumonia and collapse; for example, frequent movement of the patient. Deep breathing should be used before and after operation, and inhalations of carbon

dioxide should be given. Tight chest bandages should be avoided. The fifth step was efficient plugging or suction, or both, during dental or nose and throat operations. Finally, attention should be given to the home conditions to which the child had to return after his stay in a convalescent home.

Cardio-Omentopexy.

Dr. JOHN MACMAHON showed a male patient, aged thirty-nine years, who had been referred to him after complete investigation by Dr. Mark Lidwill. He had had two previous coronary occlusions and was now suffering from angina of effort. He had been admitted to the Royal Prince Alfred Hospital on May 3, 1938, complaining of pain in the chest and breathlessness on exertion, becoming progressively worse for a period of thirteen months. After walking only a few yards he was forced to rest on account of the severity of the pain, which disappeared with rest but reappeared after any further exertion.

On May 9, 1938, artificial pneumothorax was induced so as to cause collapse of the left lung. On May 11, 1938, the operation of cardio-omentopexy was carried out, after the method described by Lawrence O'Shannessy. The patient's convalescence was uneventful, and after a period of two months he gradually improved. At the time of the meeting he was able to walk as far as a mile on level ground, with discomfort. On walking up hills or any great distance he still had some pain, which, however, was different from the pain described before operation, in that it quickly disappeared with rest. It was in fact only momentary, whereas before operation it used to persist for some time. The patient was able to do some gardening and contemplated seeking reemployment in the railways, if suitable light work could be found for him.

Dr. MacMahon said that operations of this type were being extensively carried out in England and America, and many successful results had been published. At the present time there was a tendency to suture the adjacent lung surface to the heart rather than to use omentum as a means of obtaining a collateral circulation. However, it was impossible not to feel a little sceptical in regard to the efficiency of the collateral circulation obtained in this way, despite the experimental work carried out on dogs. There was no doubt that the patient had improved after operation; but it was possible that there were other factors, such as the opening of the pericardium, which might be responsible for any benefits derived.

Total Laryngectomy.

Dr. MacMahon then showed three patients who had been submitted to total laryngectomy for carcinoma of the larynx.

The first patient, a male, aged fifty-six years, had been admitted to the Royal Prince Alfred Hospital on December 21, 1938, complaining of sore throat and husky voice for a period of three months, and during the last six months had lost two stone in weight. Laryngoscopy, carried out by Dr. Robert Godsall, had revealed the presence of an intrinsic carcinoma of the larynx extending from the left vocal cord to the left wall of the larynx.

On December 12, 1938, under oxygen and chloroform anaesthesia, total laryngectomy was carried out—a one-stage operation. Except for the development of a temporary pharyngeal fistula convalescence was uneventful.

The patient after operation resumed his usual duties as a steward on a ship. Whilst in port in Brisbane he visited Dr. Graham Brown, who in one lesson taught him oesophageal speech. Dr. MacMahon said that the patient at the time of the meeting had quite good oesophageal speech, so that he could carry on a conversation and was able to work as a steward.

Dr. MacMahon next showed a male, aged fifty-two years, who had been admitted to hospital on August 5, 1938, suffering from laryngeal obstruction, which had been present for a period of twelve months. It was due to intrinsic carcinoma of the larynx. Urgent tracheotomy was performed under local anaesthetic. Laryngoscopy carried out by Dr. Halloran revealed an extensive carcinoma of the right vocal cord. The left cord was obscured

by oedematous ventricular folds. The blood gave a "+++" reaction to the Wassermann test and a "++++" reaction to the Kline test.

On September 9, 1938, under oxygen and chloroform anaesthesia administered through a tracheotomy tube, total laryngectomy was performed. The pathological examination showed the tumour to be a squamous celled carcinoma.

The patient was readmitted to hospital on December 1, 1938, with a nodule in the margin of his tracheotomy scar, biopsy of which revealed a recurrence of carcinoma in the thyroid gland. On December 21, 1938, removal of the thyroid gland and a further inch of trachea and adjacent skin was carried out. A course of deep X ray therapy was given after the wound had healed. At the time of the meeting the patient was quite well, and there was no evidence of further recurrence. He had gained considerably in weight, presumably following the removal of his thyroid gland.

The next patient shown by Dr. MacMahon was a male, aged fifty-nine years, who had been admitted to hospital on February 28, 1939, with a diagnosis of intrinsic and extrinsic carcinoma of the larynx. His symptoms had been present for five months. Direct laryngoscopy, carried out by Dr. R. Godsall, revealed an ulcerated carcinoma of the left vocal cord, extending onto the arytenoids and posterior surface of the epiglottis and the left wall of the pharynx.

On March 7, 1939, under oxygen and chloroform anaesthesia, total laryngectomy was performed. A pathological examination showed the tumour to be a squamous celled carcinoma of the larynx, both intrinsic and extrinsic. Following operation the patient developed purulent bronchitis, from which he quickly recovered. His general health at the time of the meeting was good, and he exhibited no evidence of recurrence. He was having a course of deep X ray therapy.

Dr. MacMahon said that neither of these two patients had yet been taught oesophageal speech; but the first patient mentioned was a good example of what could be done. He had shown that a person of ordinary intelligence after total laryngectomy could be taught oesophageal speech, and thus enabled to lead a tolerable existence and, in most cases, resume his usual occupation.

Maydl's Hernia.

Dr. MacMahon showed a female patient, aged sixty-seven years, suffering from Maydl's hernia. She had been admitted to the Royal Prince Alfred Hospital on August 29, 1938, complaining of abdominal pain and vomiting of two days' duration. She had an incisional hernia, which had developed in a gridiron incision for appendicitis, and it had become tense and tender during the last two days. Her vomitus was faeculent, her pulse was rapid and her general condition poor.

At operation two loops of small intestine were found strangulated within the hernial sac; one was viable, the other gangrenous. A connecting loop within the abdomen, two feet in length, was gangrenous. Resection of approximately three feet of intestine with side-to-side anastomosis was carried out. In view of the poor general condition of the patient no attempt to was made to repair the hernia. She made an uneventful recovery.

One important fact, Dr. MacMahon said, was revealed in these urgent cases of strangulated hernia: that was that the operation was for intestinal obstruction. The repair of the hernia was only of secondary importance, as the time spent in carrying out the repair would jeopardize the recovery of the patient. The specimen of intestine removed was shown by Dr. MacMahon.

Interscapulo-Thoracic Amputation of the Left Arm.

Dr. MacMahon also showed a male patient, aged seventy-two years, who had been admitted to the Royal Prince Alfred Hospital on February 28, 1939, with a large epithelioma on the dorsum of the left hand and a large fungating mass of malignant glands, the size of an orange, in the axilla.

On March 10, 1939, under nitrous oxide and oxygen anaesthesia, interscapulo-thoracic amputation of the left arm

was carried out. The pathological examination revealed a squamous celled carcinoma of the dorsum of the hand, with metastases in the axillary glands.

Paravertebral Thoracoplasty.

Dr. MacMahon's final patient was a female, aged twenty-eight years, who had been admitted to the Royal Prince Alfred Hospital on September 14, 1938, suffering for a period of ten years from pulmonary tuberculosis affecting the right lung. During the past four months she had had a mixed tuberculous and streptococcal pyopneumothorax, which had been unsuccessfully treated by aspiration.

On her admission to hospital her general condition was poor. She had coughed up ten to twelve ounces of sputum *per diem*. "Metaphen" treatment was attempted, but it was found that the patient had a broncho-pleural fistula. On October 12, 1938, closed drainage of the empyema cavity was carried out, and the patient's general condition improved. X ray examination revealed that the lung had completely collapsed. Pleural lavage with a weak gentian violet solution cleansed the cavity, and subsequent X ray examination revealed no expansion of the lung.

Paravertebral thoracoplasty was then carried out in three stages: on January 5, 1939, the first-stage operation—complete resection of the first and second ribs and partial resection of the third and fourth ribs; on February 22, 1939, the second stage—partial resection of the fifth to the ninth ribs; on April 20, 1939, the third stage—removal of the tenth rib and excision of the sinus. Her general condition had improved and she was gaining weight. She had hardly any sputum, and on repeated examination it had been found to contain no tubercle bacilli. She still had a small sinus, which appeared to be healing.

Uterine Polypi.

Dr. CLEMENT CHAPMAN showed four specimens of removed uteri, in all of which polypi were presenting at the *os uteri externum*. One was a fibromyomatous polypus, the second a malignant adenocarcinoma, the third a placental polypus, and the fourth an endometrial polypus arising from cystic glandular hyperplasia. All four polypi appeared through the vaginal speculum as rounded red polypi in the external os. A fifth specimen was a uterus containing a very large fibromyomatous polypus protruding into the vagina and necrosing. The patient from whom this specimen had been removed had been previously subjected to abdominal section by another surgeon and pronounced inoperable.

Dr. Chapman said that errors of diagnosis might occur in either direction. No uterine polypus, however simple in appearance, should be removed except by a set procedure in an operating theatre where hysterectomy might be performed if necessary. The twisting off of polypi in consulting rooms was a procedure which had to be condemned. All polypi removed should be submitted to microscopic examination by a skilled pathologist. On the other hand, very large necrotic fibromyomatous polypi might be regarded as malignant even after the abdomen had been opened. This error arose because the peritubercular inflammation around these necrotic polypi caused dense adhesions of the small bowel; these were very difficult to remove, but with care and patience their removal could generally be quite readily accomplished.

Intrauterine Foetal Death.

Dr. M. BRITNELL FRASER showed a patient pregnant for the third time. The foetus had died *in utero* at five months and had been retained for four months. The patient had one child, aged four years, and had had one abortion eighteen months earlier. When seen in October, 1938, she was aged twenty-three years, and her uterus was the size of a four months' gestation. In February, 1939, she had had no foetal movements for two and a half months, and the *fundus uteri* was two inches below the umbilicus. An attempt at medical induction with quinine and castor oil was ineffective. Inspection of the abdomen at regular intervals revealed no appreciable change in the size of the uterus. Three weeks prior to the meeting, on approximately the date on which her confinement was due, she

had some severe lower abdominal pain, and again an attempt at medical induction was ineffective.

Dr. Fraser said that he proposed to remove the fetus and placenta by abdominal hysterotomy, as he was of the opinion that the thrombosis in the placental sinuses would lead to retention of the placenta if an artificial induction of labour was carried out by means of packing of the uterus.

Pathological Exhibits.

Dr. Fraser next showed a uterus removed by total hysterectomy, in which a catheter had lodged for at least eighteen months. The exact history had been difficult to obtain, but there was an indefinite history of an attempt at abortion eighteen months previously and a subsequent history of chronic offensive vaginal discharge. The patient had been admitted to hospital with the diagnosis of chronic metritis, and vaginal examination revealed the presence of a foreign body slightly protruding from a sinus on the vaginal aspect of the cervix, quite one inch distant from the external os. A piece of gum elastic catheter about eight inches long was easily removed from the sinus; it was followed by a gush of foul-smelling pus. After a fortnight's vaginal douching the uterus was totally removed. An X ray film was taken of the uterus with a probe in the sinus communicating with the endometrial cavity, and this film was shown at the meeting, together with the specimen opened along the sinus.

Dr. Fraser showed a specimen of a very large multilocular ovarian cyst weighing nineteen and a half pounds and completely filling the abdominal cavity. The patient was aged thirty-nine years, and her only symptom was a gradual swelling of the abdomen.

Dr. Fraser showed photographs from a case of extreme *proliferantia uteri* before, during and after operation. He stressed the difficulty in curing the hernia of the pouch of Douglas, which in this case necessitated a further plastic operation to the posterior vaginal wall. The patient had been seen and examined a few days prior to the meeting and expressed herself as extremely comfortable as a result of the operation.

Pathological slides were shown from patients operated on during the preceding twelve months; Dr. Fraser considered them of clinical interest or illustrative of uncommon gynaecological conditions. Two were of carcinoma *in situ* in the *cervix uteri*, discovered at routine microscopic examination. A pseudo-mucinous adenocarcinoma of the ovary had been removed from a patient, aged twenty-nine years, with symptoms and signs of an infected ovarian cyst. Although there were no secondary deposits in the peritoneal cavity, Dr. Fraser decided that the patient should have a full course of deep X ray treatment, since the microscopic appearance of the tumour was suggestive of high malignancy, and also on account of the youthfulness of the patient. An unusual specimen shown was an ovarian cyst which almost reached to the xiphisternum and had caused amenorrhoea, yet microscopically was found to have a lining of granulosa cells.

(To be continued.)

Correspondence.

TRAVELLERS FOR DRUG HOUSES.

SIR: It has long been the practice for the leading surgical goods and proprietary medicine firms to send a representative to interview doctors and introduce and explain their goods.

Latterly this custom, which used to be of mutual benefit, has grown to be a nuisance, and a count taken over the last four months has disclosed that no fewer than 23 of these men have called on the doctors of the Queensland country town in which I live.

Invariably I have found them to be courteous and obliging, and a busy practitioner feels disinclined to refuse them his time. Might I suggest to the firms concerned that if they sent their representative to the doctors once a year only, instead of two, three and four times, as at present, it would allay a growing irritation among their prospective clients and would encourage mutual goodwill.

Yours, etc.,

"NOBLESSE OBLIGE".

August 4, 1939.

Post-Graduate Work.

WEEK-END COURSE IN MEDICINE AT SYDNEY.

THE New South Wales Post-Graduate Committee in Medicine announces that it will hold a course of instruction in medicine at the Prince Henry Hospital, Little Bay, during the week-end September 2 and 3, 1939. The programme is as follows:

Saturday, September 2.

- 9.30 a.m.—"Differential Diagnosis, Prognosis and Treatment of Acute Nephritis", Dr. Harold Ritchie.
- 10.30 a.m.—"The Sulphanilamides: Some General Considerations", the Director of Post-Graduate Medicine, Dr. S. A. Smith.
- 11.15 a.m.—"Treatment of Pneumonia", Dr. A. W. Holmes à Court.
- 12 noon—"Chronic Inflammations of the Lung", Dr. A. J. Collins.
- 1 p.m.—Luncheon.
- 2 p.m.—"Some Spasmodic Affections", Professor W. S. Dawson.
- 3 p.m.—"Coma", Dr. C. G. McDonald.
- 4.15 p.m.—"The Diarrhoeal Diseases of Children", Dr. E. H. M. Stephen.
- 5 p.m.—Clinico-pathological demonstration: "Diseases of the Thyroid Gland", Dr. E. B. Jones.

Sunday, September 3.

- 9.30 a.m.—"Brief Review of the Pathology of Vascular Disease", the Director of Post-Graduate Medicine, Dr. S. A. Smith.
- 10 a.m.—"Coronary Disease and Myocardial Degeneration", Dr. G. C. Willcocks.
- 11.15 a.m. to 12.15 p.m.—"Treatment of Congestive Heart Failure", Dr. Allan S. Walker. (To be followed by discussion.)

The fee for this course will be one guinea. Applications for registration, which must be accompanied by a remittance for the amount of the fee, must be made to the Secretary, New South Wales Post-Graduate Committee in Medicine, the Prince Henry Hospital, Little Bay.

Obituary.

WILLIAM JAMES MAYO.

FOR the following appreciation of the late Dr. William James Mayo we are indebted to one who knew him, but who wishes to remain anonymous.

The death of Dr. William James Mayo, following as it did so quickly upon the death of his brother Charles, shocked not only the citizens of Rochester, Minnesota, but also his many friends scattered throughout the whole world. Few small country towns win world-wide fame, and fewer still owe such fame to the glory reflected from their

favourite sons; but Rochester's fame is entirely due to the fact that within her boundaries Dr. William James Mayo and Dr. Charles Horace Mayo built the immense organization known as the "Mayo Clinic"—immense in the size and number of its buildings which express its physical strength, immense in the variety and quality of medical and surgical treatment for which it is famous, immense in the number of new ideas and practices which have emanated from its staff, and, finally, immense in the grandeur of the spiritual ideas of honesty, service, keenness and enthusiasm which have been the guiding stars of its leaders.

"Dr. Will", as he was always called, was the elder of the two brothers and was born at Le Sueur, Minnesota, on June 29, 1861, about two years before his father commenced to practise in Rochester, unknowingly sowing the seed of what was destined to become the Mayo Clinic.

William Mayo, in describing his own youth, wrote: "My brother and I were brought up in medicine as farm boys are brought up on a farm. As fast as we were old enough, we were given tasks that had to do with medicine. We were helpful in taking care of the office, in learning to drive the horses on father's professional rounds, and aiding as much as we could in all sorts of medical emergencies. It never occurred to us that we could be anything but doctors." A little incident of a new microscope, told by him, shows well the keenness of his family's early struggles. After a clinical trip to the East, William Worrell Mayo, the father, at breakfast pulled out of his pocket an illustrated circular, describing a new microscope which did wonderful things; but it cost 600 dollars, and he had no money left after the trip East. He said that the only way he could get it was to mortgage the house, which stood where the clinic is now situated. The mother had Scotch prudence; they had had a hard time to get the home paid for; but after considerable thought and consultation she finally said: "Well, if you could do better by the people with this new microscope we should buy it." The words of a doctor's true helpmate.

Another story that "Dr. Will" never tired of telling, and which gives an idea of his own and of his brother's initiation into medicine, is the following: "When I was sixteen I helped father with his surgical operations, acting as first assistant, and Charlie at the ripe age of twelve was forced into giving the anæsthetic, the old 'A.C.E. mixture'—alcohol one part, chloroform two parts, and ether three parts. He was initiated at an operation for the removal of a large ovarian tumour. Father was one of the first surgeons in America to undertake these operations. The operation was done in a private home. In the midst of the operation the doctor who was giving the anæsthetic fainted. Charlie climbed up onto a cracker [biscuit] box and gave the anæsthetic, and he did so well that from that time on he was the family anæsthetist."

William Mayo graduated from the University of Michigan, M.D. in 1888 and M.A. in 1890. Many American and foreign universities honoured him and themselves by conferring on him honorary degrees, and he was also honoured by the Scottish, English, Irish and Australasian surgical colleges with their honorary fellowships. He was also a Fellow of the American College of Surgeons, and its President in 1917-1919. In 1930 he was awarded the gold medal as Past-President of the American Medical Association.

During the World War, alternating with his brother, "Dr. Charlie", William Mayo acted as chief consultant for all surgical services in the United States Army, and was awarded the Distinguished Service Medal of the American Army in 1919. In 1936 he was placed on the inactive service list with the rank of brigadier-general. He was given a citation for distinguished service by the national organization of the American Legion, presented by the national commander, and a commemorative plaque presented by the President of the United States in person in 1924.

In all, William Mayo contributed 575 articles to surgical literature. His first paper, in collaboration with his father, was "Reports of Operations for Ovarian Tumors", published in the *Transactions of the Minnesota State Medical Society* in 1885, pages 45-48. The first paper in which William and

Charles collaborated was titled "Report of Clinic at St. Mary's Hospital, Rochester, Minnesota, January 19, 1891", and appeared in the *Northwest Lancet*, Volume XII, 1892, at page 198.

From the beginning of this unique comradeship and surgical partnership Charles's interests seemed to lie above and below the abdomen, while William's interests appeared to have been entirely within the abdomen. A few of William's contributions to our knowledge of the abdomen may be recalled: Mayo's anæmic spot, Mayo's pyloric vein, the lymphatic involvement in cancer of the stomach, his many contributions to the surgery of the biliary tract, including his operation for repair of the divided common duct. Our present knowledge of the surgery of the stomach and duodenum, whether it be for ulcer or carcinoma, is in a large measure due to his observations and writings. He has also made many and important contributions to the surgery of the spleen, large bowel and urinary system. One of his best known contributions is "The Incision for Lumbar Exposure of the Kidney", *Annals of Surgery*, Volume LV, 1912, page 63.

When "we were marching through medicine" in Sydney, Professor "Jummy" Wilson and the late Professor Anderson Stuart ("T.P.A.") were without doubt the two most impressive personalities that we were fortunate enough to meet; and I think by saying that "Dr. Will" was one such as these I shall convey to the not too recent graduate of the Sydney school the type of man he was. He carried himself always with almost the bearing of a sergeant-major on parade. Even at the age of sixty-five years he had no superfluous flesh; his eyes were greyish-blue, framed by a face which denoted strength of character, endurance and withal kindness and thoughtfulness.

His surgical work was characterized by gentleness and respect for the tissues. He, like Moynihan, of Leeds, made the solution of the mysteries of the abdomen his chief surgical interest, and to my mind the greatest public compliment he ever received was paid him by Moynihan, his friend and in many ways his friendly rival. When Moynihan was collecting material for his monograph on the spleen he went to Rochester and reviewed the clinic records of diseases of the spleen, and thanked William Mayo in his foreword for the help given him—a graceful act by the British Empire's leading abdominal surgeon.

One has often wondered how much personal sacrifice of friendship and pleasure was entailed by the government of the Mayo Clinic; but though at times the sacrifice must have been great for William Mayo and his wife, I am sure that they found a more than compensating satisfaction in their life's achievements. "Dr. Will's" personal contributions to surgery were such that as long as surgery is practised his name, along with that of his lifelong working companion, Charles, will persist. Lister, Pasteur, Moynihan, Cushing, Halstead, Robert Jones, Hamilton Russell, Kocher, the Mayo brothers and J. B. Murphy will always be named among the international captains of surgery.

The clinic idea is another of their joint contributions. At Rochester it is a wonderful success; but with such leaders it could not fail. As to its successful application, though with its basic principles we must all agree, I feel that there is grave doubt as to its success in other centres, particularly in large cities.

Ex-fellows scattered throughout the whole civilized world are grateful for the opportunities and the experiences which the magnificent dream of William and Charles Mayo made possible. There can be few places in the world that do not number amongst their inhabitants one or more who owe their restoration to health to the lessons learned from the teachings of the clinic.

William Mayo's greatest pleasure was a week-end spent on his yacht, cruising up and down the Mississippi River. He and his devoted wife celebrated the fiftieth anniversary of their wedding on November 20, 1934. Their married life was enriched by two daughters. The elder is now Mrs. D. C. Balfour and the younger is Mrs. Walters Waltman, two surnames which are familiar to readers of surgical literature.

Australian medicine will mourn with American medicine the passing of such a distinguished surgeon, the more

so because they well remember his visit to Australia in 1924 and the interest he took in the work of Royle and Hunter. As a matter of historical record it may be said that it was largely due to William Mayo's enthusiasm that world-wide interest in their work became aroused so quickly.

The sympathy of organized Australian medicine will be extended to Mrs. W. J. Mayo and her daughters. It will also be extended to the two men who took the place of sons in William Mayo's heart and dreams, and in turn were loyal members of his army of helpmates. Possibly on these two men will fall the burden of responsibility which the management of such an institution entails. As it is impossible to think of medicine without the Mayo Clinic, its "Collected Papers" and the "Proceedings of its Staff Meetings", the earnest wish of Australian medical practitioners is that the loyalty of members of the staff will make the burden light. The greatest physical monument which can be maintained in memory of the two brothers is the perpetuation of their clinic for the treatment of the sick and the advancement of medical science.

BERTRAM CRELLIN.

WE regret to announce the death of Dr. Bertram Crellin, which occurred on August 8, 1939, at Melbourne, Victoria.

HENRY LAURIE.

WE regret to announce the death of Dr. Henry Laurie, which occurred on August 8, 1939, at Melbourne, Victoria.

AENEAS JOHN McDONNELL.

WE regret to announce the death of Dr. Aeneas John McDonnell, which occurred on August 11, 1939, at Toowoomba, Queensland.

SINCLAIR GILLIES.

WE regret to announce the death of Dr. Sinclair Gillies, which occurred on August 13, 1939, at Sydney, New South Wales.

Research.

THE LEAGUE OF NATIONS TECHNICAL COMMISSION OF PHARMACOPEIAL EXPERTS.

A MEETING of the Technical Commission of Pharmacopœial Experts of the League of Nations was held at Geneva from May 10 to 16, 1939.

Dr. Hampshire (London) presided and there were present also Professors Baggesgaard-Rasmussen (Copenhagen), Eder (Zurich), Fullerton Cook (Philadelphia), van Itallie (Leyden), Tiffeneau (Paris) and Zuns (Brussels).

The chairman reported that the reference subcommittee on galenical pharmacy had been duly constituted since the last meeting and had made some progress with the work of defining general methods of preparation and of unifying formulae.

The commission revised and extended a draft of the "General Notices" containing descriptions of general tests and methods, together with explanations of the terms and modes of expression to be employed in all monographs. Drafts of 85 monographs which had been prepared by

members of the commission since the last meeting were presented for consideration. These were classified into groups of similar substances, such as: alkaloids and alkaloidal salts, cinchona alkaloids, crude drugs, the digitalis group, mercurial compounds, the ergot group, general organic chemicals. Certain monographs from each group were selected for detailed discussion, and general principles relating to all the monographs of each group were worked out. Arrangements were made for the preparation of new drafts in accordance with the decisions taken in relation to the individual monographs.

In the course of the discussions various problems presented themselves for investigation and the members of the commission formed themselves into small groups for the investigation of specific problems, such as the tests for purity of quinine salts, the standardization of ergot and its preparations, the alkaloidal assays of crude drugs, the ash content of crude drugs.

Individual members undertook to report on other subjects, such as the terminology relating to solubilities, thermometers, standards for colour and absence of turbidity, limit tests for heavy metals and other inorganic impurities, sterilization of solutions for injection, neutrality reactions of alkaloidal salts, the assay of acetylsalicylic acid, various solubilities of alkaloids.

A draft of a report on doses, containing recommendations for usual doses and maximum doses, was discussed, amended and adopted. A list of international names was drawn up and adopted tentatively. The list of drugs for description, prepared at the last meeting, was reviewed and further allocations were made among the members, who undertook to prepare first drafts of new monographs.

Proceedings of the Australian Medical Boards.

TASMANIA.

THE undermentioned have been registered, pursuant to the provisions of the *Medical Act*, 1918, of Tasmania, as duly qualified medical practitioners:

Brown, Maxwell Mansfield, M.B., B.S., 1938 (Univ. Sydney), Royal Hobart Hospital, Hobart.

Roberts, Silvio Gordon, M.B., Ch.M., 1934 (Edinburgh), Wynyard.

Trembath, Kenneth Roy, L.R.C.S., L.R.C.P., 1927 (Edinburgh), L.R.F.P.S., 1927 (Glasgow), Latrobe.

Nominations and Elections.

THE undermentioned have applied for election as members of the New South Wales Branch of the British Medical Association:

Bilton, John Herbert, M.B., B.S., 1939 (Univ. Sydney), "Sunnyside", 413, Brunswick Street, The Valley, Brisbane.

Dakin, William Peter Harvey, M.B., B.S., 1939 (Univ. Sydney), Royal North Shore Hospital, St. Leonards.

Funder, Brian Patrick, M.B., B.S., 1933 (Univ. Adelaide), F.R.C.S., 1937 (Edinburgh), Box 49 B, P.O., Broken Hill.

Harper, Archibald Maclean, M.B., B.S., 1938 (Univ. Sydney), Fitzwilliam Street, Port Kembla.

Low, David Irving, M.B., B.S., 1935 (Univ. Sydney), Alexandria Street, Kurri Kurri.

Wherrett, Sydney Wallis, M.B., B.S., 1937 (Univ. Sydney), 340, Marrickville Road, Marrickville.

Matthews, Robert Frederick, M.B., B.S., 1938 (Univ. Sydney), Royal North Shore Hospital, St. Leonards.

The undermentioned have applied for election as members of the South Australian Branch of the British Medical Association:

Kaufman, Hermann, L.R.C.P., L.R.C.S. (Edinburgh), L.R.F.P.S. (Glasgow), M.D. (Hamburg), 1939, Parkside Mental Hospital, Parkside.

Helman, Carl Joe, M.D., 1936 (Milan), 63, Lefevre Terrace, North Adelaide.

The undermentioned has been elected a member of the South Australian Branch of the British Medical Association:

Shepherd, David Wickham, M.B., B.S., 1938 (Univ. Adelaide), Adelaide Hospital, Adelaide.

Diary for the Month.

- AUG. 22.—New South Wales Branch, B.M.A.: Medical Politics Committee.
 AUG. 23.—Victorian Branch, B.M.A.: Council.
 AUG. 24.—New South Wales Branch, B.M.A.: Clinical Meeting.
 AUG. 25.—Queensland Branch, B.M.A.: Council.
 AUG. 31.—New South Wales Branch, B.M.A.: Branch.
 AUG. 31.—South Australian Branch, B.M.A.: Branch.
 SEPT. 1.—Queensland Branch, B.M.A.: Branch (Jackson Lecture).
 SEPT. 5.—New South Wales Branch, B.M.A.: Organization and Science Committee.
 SEPT. 6.—Victorian Branch, B.M.A.: Branch.
 SEPT. 6.—Western Australian Branch, B.M.A.: Council.
 SEPT. 7.—South Australian Branch, B.M.A.: Council.
 SEPT. 8.—Queensland Branch, B.M.A.: Council.
 SEPT. 12.—New South Wales Branch, B.M.A.: Executive and Finance Committee.
 SEPT. 19.—New South Wales Branch, B.M.A.: Ethics Committee.

Medical Appointments.

Dr. H. T. Illingworth has been appointed Medical Officer of Health to the Naremburn Road Board, in accordance with the provisions of *The Health Act, 1911-1937*, of Western Australia.

Dr. I. M. O'Loughlin has been appointed a Resident Medical Officer at the Adelaide Hospital, Adelaide, South Australia.

Professor J. C. Windeyer and Dr. J. R. Ryan have been appointed members of the Medical Board of New South Wales, in accordance with the provisions of the *Medical Practitioners Act, 1933-1939*, of New South Wales.

Medical Appointments Vacant, etc.

For announcements of medical appointments vacant, assistants, locum tenentes sought, etc., see "Advertiser", pages xvi-xix.

BRITISH MEDICAL AGENCY OF QUEENSLAND PTY. LTD.: Medical Officer.

RENWICK HOSPITAL FOR INFANTS, SUMMER HILL, NEW SOUTH WALES: Honorary Relieving Physicians.

TAMBO HOSPITALS BOARD, TAMBO, QUEENSLAND: Medical Superintendent.

THE WOMEN'S HOSPITAL, CROWN STREET, SYDNEY, NEW SOUTH WALES: Resident Medical Officers.

VICTORIAN EYE AND EAR HOSPITAL, MELBOURNE, VICTORIA: Resident Surgeons.

Medical Appointments: Important Notice.

MEDICAL PRACTITIONERS are requested not to apply for any appointment referred to in the following table without having first communicated with the Honorary Secretary of the Branch named in the first column, or with the Medical Secretary of the British Medical Association, Tavistock Square, London, W.C.1.

BRANCHES.	APPOINTMENTS.
NEW SOUTH WALES: Honorary Secretary, 135, Macquarie Street, Sydney.	Australian Natives' Association. Ashfield and District United Friendly Societies' Dispensary. Balmmain United Friendly Societies' Dispensary. Leichhardt and Petersham United Friendly Societies' Dispensary. Manchester Unity Medical and Dispensing Institute, Oxford Street, Sydney. North Sydney Friendly Societies' Dispensary Limited. People's Prudential Assurance Company Limited. Phoenix Mutual Provident Society.
VICTORIAN: Honorary Secretary, Medical Society Hall, East Melbourne.	All Institutes or Medical Dispensaries. Australian Prudential Association, Proprietary Limited. Mutual National Provident Club. National Provident Association. Hospital or other appointments outside Victoria.
QUEENSLAND: Honorary Secretary, B.M.A. House, 225, Wickham Terrace, Brisbane, B.17.	Brisbane Associate Friendly Societies' Medical Institute. Prosperpine District Hospital. Members accepting LODGE appointments and those desiring to accept appointments to any COUNTRY HOSPITAL or position outside Australia are advised, in their own interests, to submit a copy of their Agreement to the Council before signing.
SOUTH AUSTRALIAN: Secretary, 175, North Terrace, Adelaide.	All Lodge appointments in South Australia. All Contract Practice Appointments in South Australia.
WESTERN AUSTRALIAN: Honorary Secretary, 205, Saint George's Terrace, Perth.	Wiluna Hospital. All Contract Practice Appointments in Western Australia.

Editorial Notices.

MANUSCRIPTS forwarded to the office of this journal cannot under any circumstances be returned. Original articles forwarded for publication are understood to be offered to THE MEDICAL JOURNAL OF AUSTRALIA alone, unless the contrary be stated.

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